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Environmental Health: Country and Regional Activities in the Americas

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The United Nations symbols shown here represent two major social goals to which the citizens and leaders of countries throughout the world aspire. One, 'health for all by the year 2000,' targets the attainment by everyone everywhere by this century's end of a level of health that would permit them to lead socially and economically productive lives. The other goal, depicted by ten small drops of water within a larger, all-encompassing one, suggests the ten years and the ultimate aim of the International Drinking Water Supply and Sanitation Decade, 1981-1990.

The two symbols are here joined with a purpose, namely to reflect that access to drinking water and sanitation services is a critical precondition to the attainment of universal health. The challenge implied in providing these services is a formidable one: today only about one-third of those living in the world's least developed countries have dependable access to a safe water supply and adequate sanitary facilities.

In comparison to other parts of the developing world, the Region of the Americas has advanced much farther down the road toward the provision of social services and the achievement of collective well-being. Still, to paraphrase the words of one American poet, there remain promises to keep and miles to go before we sleep. In pursuit of the challenge ahead, the Pan American Health Organization, working in concert with all the governments of the continent, is applying its energies and resources to achieve the goals of water, sanitation, and health for all.



Environmental Health: Country and Regional Activities in the Americas



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CONTENTS

	<i>Page</i>
<i>Preface</i>	v
<i>Environmental Health and Health for All</i>	1
The Situation in the Americas	3
The Role of the Pan American Health Organization	6
<i>Horizontal Cooperation in Environmental Health</i>	8
World Bank	8
Inter-American Development Bank	9
German Technical Cooperation Agency	10
Canadian International Development Agency	11
International Development Research Center of Canada	11
United States Agency for International Development	11
Inter-American Association of Sanitary and Environmental Engineering	12
United Nations Environment Program	12
United Nations Children's Fund	13
United Nations Development Program	14
United Nations Economic Commission for Latin America	15
United Nations Educational, Scientific, and Cultural Organization	16
United Nations Food and Agriculture Organization	16
International Labor Organization	17
European Economic Community	17
Organization of American States	17
Caribbean Community Secretariat	18
Caribbean Development Bank	18
Conference of Ministers of Health of the Andean Pact Countries	19
Conference of Ministers of Health of Central America and Panama	20
Pan American Health and Education Foundation	20
<i>Water and Sanitation</i>	22
Water and Sanitation: Health and Development	22
PAHO Activities and the Decade	31
Activities at the Regional Level	33
Activities at the Country Level	39
Other Decade-related Activities of the Organization	44
Financing of the Decade	46
Guidelines for Drinking Water Quality	48
Fluoridation	49
<i>Operation and Maintenance of Water Systems</i>	51
<i>Institutional Development</i>	54
<i>Appropriate Technology</i>	61
<i>Solid Waste Management</i>	66
The PAHO Regional Program	66
Recent Activities in the Countries	71

	<i>Page</i>
<i>Occupational Health</i>	73
Occupational Hazards of Agricultural Workers	73
Prevalence of Chronic Lung Diseases in Textile Workers	76
PAHO Cooperation in the Region	77
Activities in the Countries	81
<i>Prevention and Control of Pollution and Other Environmental Health Hazards</i>	83
Prevention and Control Efforts of the Organization	87
Programs Ongoing in the Countries	91
<i>Food Protection</i>	96
Situation in the Americas	96
Regional Program of the Organization	99
Programs Ongoing in the Countries	103
<i>Assessment of the Impact of Development on Health and Ecology</i>	105
Regional Program of the Organization	108
Cooperation with the Countries and Other Sectors	111
<i>Women and Environmental Health</i>	113
Regional Plan of Action for Women	113
Women and Water	115
Occupational Health of Women	117
<i>Human Resource Development</i>	121
PAHO Regional Program	122
Motivational Activities	122
Operational Activities	123
Activities Ongoing in the Countries	125
<i>Information Exchange</i>	128
Pan American Information and Documentation Network—REPIDISCA	128
Activities Ongoing in the Countries	129
Other Collaboration	131
Information and Publication	132
<i>Research</i>	134
PAHO Efforts in Support of Research	135
Research at the National Level	136
Prospects for the Future	139
<i>Disaster Preparedness and Emergency Relief</i>	141
<i>Caribbean Activities</i>	145
Environment and Public Health in the Wider Caribbean	145
Action Plan for Environmental Management in the Wider Caribbean	148
Subregional Environmental Health Project	150
Caribbean Environmental Health Institute	151
Turks and Caicos Study	153
Caribbean Environmental Health Memo	153

PREFACE

The present volume represents the second in a series of issues on environmental health in the Region of the Americas. The first, *Environmental Health Activities of the Pan American Health Organization*, aimed to provide a forum of information on current events in the field. It has been favorably received by readers throughout the hemisphere—PAHO staff, nationals in the environmental and health sectors, and representatives of other international agencies.

That initial attempt focused on regional programs carried out by personnel at the Organization's Headquarters in Washington, D.C., and at the Pan American Centers for Sanitary Engineering and Environmental Sciences (CEPIS) and for Human Ecology and Health (ECO) in Lima, Peru and Metepec, Mexico. In order to assure broader coverage of available information in subsequent reports, those serving in the Organization's country offices as well as in other PAHO units were urged to contribute to future issues.

Response to that appeal is evident in the pages that follow: they present much more material both on country-based activities and on programs in other areas of pertinence to environmental health. In this effort to disseminate information on the Organization's work with the governments of the Region in environmental health, staff in some countries have proved particularly cooperative. It is hoped that others will join them in presenting information for issue number 3 in the series of reports.

In addition to information on country, subregional, and regional activities in the various environmental health program areas, this issue includes features on two concerns that are assuming ever-greater importance in the pursuit of health goals: horizontal cooperation and women in health and development. And, most important of all, it highlights the primary health care objectives related to the protection and promotion of environmental health that have been specified in the Plan of Action for implementation of regional strategies for health for all by the year 2000.

*Frank A. Butrico, Chief
Division of Environmental Health Protection*

Environmental Health and Health for All

An environment in which everyone can lead socially and economically productive lives: this is the future to which all the countries of the world aspire. To realize that aspiration implies universal attainment of a level of health that will permit people to work productively and participate actively in the social life of their communities. Health, it is understood, is an integral part of development. Thus, the World Health Organization and its regional counterpart the Pan American Health Organization have formulated strategies to attain the goal of "health for all by the year 2000." Success in achieving this goal will involve all the countries of the world and will enlist the participation of people in all walks of life—individuals, families, communities, all categories of health workers, governments, private organizations, and international agencies.

As development is conditioned by health, so is health predicated on the environment: the earth we inhabit, the water we drink, the air we breathe, the food we eat, the places where we work, and the cities where we live. The environment, in turn, is affected by numerous factors: *population*—expected to reach a global 6.5 billion by the turn of the century; *urbanization*—reflected in the estimate that by the year 2000 half of the people in the world will live in cities, with 12 of the 15 largest metropolitan areas located in developing countries; and *industrialization*—predicted to grow many times over its present levels.

These demographic trends will place additional burdens on physical and social infrastructures, increasing the dangers of unemployment and underemployment. They will affect the production and distribution of food, and they will have qualitative and quantitative implications for water, education, housing, sanitation, and health care. In such a context of social change, more illness means a greater drain on the world's economy, whereas more healthy people would mean more human energy and therefore greater potential human development.

In many urban and rural areas the basic environmental concerns continue to prevail. Air and water quality have deteriorated to levels that endanger human health. Garbage collection cannot begin to keep pace with garbage generation, and improper handling and disposal of solid wastes

lead to the proliferation of disease vectors. Noise and congestion increasingly affront urban dwellers, while injuries and occupational diseases due to hazardous environmental conditions are common. Food-borne diseases continue to be an important cause of morbidity in both developing and industrialized countries.

Rapidly expanding human populations throughout the world imply an increasing problem both with communicable diseases of direct and vector-borne transmission and also with diseases resulting from environmental pollution. Unfortunately, as these problems increase exponentially with the increase in human density, available health resources to combat them increase only arithmetically or not at all in real terms.

On the other hand, colonization of new, underinhabited areas often brings large populations into completely new environments, requiring rapid and intensive efforts to readapt many traditional areas of life and behavior to cope with the new conditions. Maintaining satisfactory health status is always difficult as new diseases, altered incidences of known diseases, and unsatisfactory conditions of environmental sanitation are encountered while health care resources are invariably either deficient or unavailable.

Concomitant with increasing urbanization, industrialization, and changing life-styles has been an increase in mental health disorders and noncommunicable diseases such as cancer, cardiovascular disorders, and respiratory tract illness. Although such illnesses were once considered to be degenerative, constitutional, and nonpreventable, they are now recognized to be at least partly determined by the environment.

It is against this prospective background—causes of death and disease, nutritional status, water supply and sanitation, the economic situation, and demographic trends—that the above-mentioned health for all strategy will evolve. A few specific examples may serve to illustrate the complexity of this background and the implications it has for the developing world:

- Nearly 1,000 million people are trapped in the vicious cycle of poverty, malnutrition, disease, and despair that saps their energy, reduces their work capacity, and limits their ability to plan for the future.
- Life expectancy in developing countries is 56 years; in industrialized nations, 72. One in ten infants in the developing world dies before its first birthday; in the industrial world one in 50 dies.
- Most deaths in developing countries result from infectious and parasitic diseases, which are closely related to prevailing social and economic conditions and which impede social and economic development.
- Diarrheal diseases—transmitted by human fecal contamination of soil, food, and water—are most widespread in the developing countries.

- Only about a third of the people in the world's least developed countries have dependable access to a safe water supply and adequate sanitary facilities.
- Cardiovascular diseases, cancer, and accidents are increasing in certain developing countries, where environmental health problems due to industrialization and urbanization are assuming growing importance.
- Undernutrition due to an insufficient and unsafe food supply afflicts hundreds of millions of people, reducing their energy and motivation, undermining their performance in school and at work, and reducing their resistance to disease.

In the context of these human health particulars, the environment plays a critical part, and any consideration of health needs implies taking into account the state of the environment. There can be no individual or community well-being without a healthy environment: safe water, adequate sanitation, clean air, wholesome food, and a risk-free workplace.

The Situation in the Americas

Collectively the countries of the Americas embrace a variety of cultural and social patterns, political administrations, and economic structures, coupled with a blend of both traditional customs and progressive innovations. Moreover, great disparities exist not only among countries but also within them. Some of the areas are economically advanced, whereas others are at earlier stages in the process of development. Many urban centers are characterized by sophisticated industrial complexes, systems of transportation, and energy use, while other population clusters are only partially covered with such basic services as water supply and sanitation.

The population of the hemisphere has reached over 615,000,000. Latin America and the Caribbean alone have more than 350 million, and by the year 2000 their numbers will grow to some 600 million. The greatest concentrations are in the urban areas, where large percentages of people live in poverty. Cities are expanding so rapidly that a severe strain is being placed on the environmental health and medical services for disease prevention and control.

Environmental health conditions in Latin America and the Caribbean are likewise varied. At the same time that most countries in the Region are facing basic sanitation problems, they are also confronting the problems of urbanization and industrialization. In general terms gastrointestinal infections, hepatitis, schistosomiasis, filariasis, some viral diseases, and others related to water and poor sanitation are highly prevalent and each year result in hundreds of thousands of deaths. This situation can be considerably improved with the provision of adequate water supply and sanitation to urban and rural areas.

It is instructive to look at the conditions predicated primarily on environmental circumstances—water, sanitation, and food. These have been grouped by the Eighth Revision of the International Classification of Diseases under the heading of intestinal infectious diseases, which include typhoid fever, paratyphoid fever, other salmonella infections, bacillary dysentery, bacterial food poisoning, amebiasis, other protozoal intestinal diseases, enteritis due to other specified organisms, and diarrheal diseases. Together these environmentally determined diseases, as a group, figure in the top ten causes of death in most of the countries of the Americas—and in the top five in many.

The impact of intestinal infectious diseases on the 1-4 year age group is evident in the impressive rates of death due to intestinal infections per 100,000 population in a select list of Latin American countries (in the latest year for which data are available): Colombia—108.7, Ecuador—234.9, El Salvador—186.5, Guatemala—426.9, Guyana—120.0, Honduras—113.7, Mexico—131.8, Nicaragua—105.3, and Paraguay (area of information only)—203.1.

The goals of the International Drinking Water Supply and Sanitation Decade (1981-1990) and of the Regional Plan of Action for Health for All by the Year 2000 bring the hope that safe water and sanitation will be available to the urban and rural population throughout the hemisphere by 1990, and that coverage will continue in subsequent years. Presently about one-fourth of the urban population has no easy access to potable water supply, and in rural areas the unserved proportion is much larger. Attainment of the goals will largely depend on finding solutions to present and future technological, social, economic, and political constraints. Development of technologies adapted to local conditions for the provision of water and the disposal of wastes is needed as are the management, operation, and maintenance of these services by the local community.

Population growth and the ever-greater use of material goods are resulting in the production of an increasing volume of solid wastes per capita, especially in urban areas, thus frequently bringing the “garbage problem” to the front page of many newspapers throughout the continent. The inadequate management of these wastes contributes to the spread of diseases through vectors and to air, water, and soil pollution, as well as to the consequent generation of social and economic problems.

Development, along with its positive contributions, can bring in its wake health risks. Significant levels of urban and industrial pollution are already present in many parts of the Americas. Air pollution is high and increasing in the major cities, according to information collected by the

PAHO-sponsored Pan American Air Sampling Network (REDPANAIRES). Water pollution is a problem of comparable import: only 5-10 per cent of city-generated sewage is treated in Latin America and the Caribbean—the rest being discharged, untreated, into the water courses of the Region. Most of the cities of over one million inhabitants and several industrial complexes have significant pollution problems.

The domestic, industrial, commercial, and agricultural use of thousands of chemicals, with hundreds of new ones being marketed each year, poses a serious threat to health in the form of air, water, food, and soil contamination. Toxic chemicals may cause widespread physiological, behavioral, and mental as well as physical problems.

The protection of workers' health against intoxications resulting from the application of pesticides for agricultural purposes, accidents caused by use of basic and industrial tools, and risks resulting from use of complex machinery and exposure to chemical substances, are of paramount importance—particularly as the incidence of occupational accidents and diseases is from six to ten times greater in developing countries than in developed ones.

Food is the most important pathway by which man is exposed to persistent pollutants, such as DDT, other organic compounds, and heavy metals, which may concentrate through biological processes in the food chain. Food additives are another source of food contamination.

Although not generally perceived as a health threat, noise is a serious problem in many urban and industrial areas.

Accelerated industrial development raises the prospect of chemical pollution and toxic substances becoming one of the foremost problems in Latin America and the Caribbean in a relatively short period of time, particularly in view of the projected potential in the Region for industrialization—estimated at four to five times the current level.

Further, most of the countries are in the process of implementing large-scale projects—hydroelectric power generation schemes, construction of highways, colonization, and natural resource exploitation—which may result in modifications of the physical environment that profoundly affect the ecology and human health.

The above considerations fully demonstrate the need for Latin American and Caribbean countries to give priority attention to environmental and ecological health. A great deal of work is required at various levels for the preservation and improvement of the human environment. Of particular significance are the implications for public agencies in the Region concerned with people's health. Although, many problems of the human

environment go beyond the traditional sectoral boundaries and require intersectoral approaches, health agencies should take the initiative (with the assistance of interdisciplinary groups) to identify or predict those problems, disseminate information on them, and promote coordination for their solution.

The Role of the Pan American Health Organization

The member governments of the Pan American Health Organization have adopted a Regional Plan of Action for Health for All (see inset) that is directed to the improvement of environmental health as part of a total social and economic development effort and integrated with other health activities—disease control, promotion of health and well-being of the family, establishment of an infrastructure for the delivery of health services, and the development of human resources.

In support of the countries' efforts to attain universal well-being by the century's end, the work of the Organization will concentrate on the following strategic approaches:

- Exchange of information on national experiences among countries.
- Research and development to identify and generate appropriate technology for the essential elements of primary health care.
- Technical support, including preparation and dissemination of guiding principles and development of methods to assess technologies.
- Training, including that of trainers, and development of institutions.

Both the World Health Organization and the Pan American Health Organization are committed to cooperation in meeting global and regional health needs as they relate to the environment. In the long run, the purpose of their efforts is to enable countries themselves to realize primary health care, including environmental health, as part of their overall development and in the spirit of self-reliance.

In the decade that has passed since the International Conference on the Environment held in Stockholm, people throughout the world have become more acutely aware of the problems before them. Countries and international cooperation agencies now have the challenge to act in concert to avoid irreversible environmental danger and its deleterious impact on health and socioeconomic development and to assure a future of universal health and well-being.

Plan of Action

PROTECTION AND PROMOTION OF ENVIRONMENTAL HEALTH

The Plan of Action is directed to the improvement of environmental health as part of a total social and economic development effort and integrated with other health activities—disease control, promotion of health and well-being of the family, establishment of an infrastructure for the delivery of health services, and the development of human resources. Among the areas of activity that characterize these intersectoral relationships are the provision of drinking water and excreta disposal services, prevention and control of many bacterial, viral and parasitic diseases; improvement and expansion of food safety services; prevention and control of chemical and physical pollution and other health hazards, and efforts to reduce the incidence of noncommunicable diseases; prevention of adverse impacts of river-basin and industrial development on human health and the ecology; and interaction of rural development with programs concerned with the health of agricultural workers and their families, vector control, and the safe application of pesticides and fertilizers.

In implementing the Plan of Action it is essential that some coordination and cooperative mechanism be established at the national level since environmental health responsibilities are divided among many agencies, and the situation varies from country to country. However, the Ministry of Health in each country should assume the prime responsibility and leadership in stressing the public health justification for actions to be taken, stimulating national commitments and identifying the benefits to be derived from intersectoral cooperation. This leadership is particularly critical in those areas concerned with the development of appropriate technology; the establishment of national focal points for the exchange of information; training of personnel; and the interaction with lending agencies and donor countries on project identification and preparation.

The highest priority in the Plan of Action will be given to the provision of drinking water and basic sanitation services to as many people as possible.

Horizontal Cooperation in Environmental Health

The Regional Plan of Action for Health for All will require that new mechanisms be developed for the identification and resolution of problems that require a multidisciplinary and multisectoral approach. It will likewise reinforce the Organization's liaison activities and catalytic role in the reorientation and strengthening of technical and economic cooperation among developing countries and cooperation with other international agencies.

What has been recently termed "horizontal cooperation" represents for the environmental health field the continuation of a long tradition. PAHO, through its Division of Environmental Health Protection, has always carried out close cooperative efforts with other international agencies. Some of the most recent interinstitutional collaborative activities are described below.

World Bank

PAHO and the World Bank are carrying out a cooperative program that has involved preparation of water supply and sanitation sector studies for all the major countries in the Americas, which in turn have served as a benchmark for the regional launching of the Water and Sanitation Decade. Moreover, the sector study approach has been extended to the field of solid wastes, and the first of a planned series was conducted in Chile.

As part of the program, project preparation assistance was given to Argentina for a multi-city water supply project that was to cost about US\$600 million and to be financed by the World Bank. PAHO continued technical cooperation for World Bank-financed village water supply and sanitation projects in Haiti, Nicaragua, and Paraguay, which total approximately \$15 million.

Both agencies are discussing ways of recasting the cooperative program of the two organizations specifically to find ways of removing obstacles to expansion of the lending programs in rural water supply and sanitation.

Manpower surveys and inventories are to be undertaken, training courses and seminars organized and carried out by the staffs of the cooperative program, and programs and projects requiring loan financing prepared according to guidelines. The country-specific nature of these tasks indicates that the work is best commissioned regionally between the respective regional offices of the Bank and the Organization.

Inter-American Development Bank

The Inter-American Development Bank continued supporting the construction of drinking water supply and sanitation services through the financing of projects in the countries, giving priority attention to rural populations. During the period under review, the IDB made loans to a large number of countries in the Region.

PAHO continued to play the role of executing agency for IDB-financed technical cooperation projects, particularly in institutional development programs such as that carried out in Guatemala with the Executive Unit of the Rural Aqueduct program (UNEPAR), which is part of the Ministry of Public Health and Social Assistance.

In 1981 the IDB and PAHO agreed to develop a cooperative program that is being carried out in 1982. The program considers the development of water supply and sanitation activities in a determined number of countries, including the updating of sectoral studies and the preparation of feasibility studies; as a result, priority projects, financial requirements, and institutional and human resource development needs will be identified. Advisory services will be given to the countries on technical, institutional, financial, and economic aspects of the projects, as well as in the preparation of project proposals that can be used to make credit requests to the Bank. This cooperative scheme will favor PAHO/IDB collaboration in the solution of specific problems that now impede development of the water supply and sanitation sector.

PAHO collaborated with the IDB, GTZ, and the countries of Central America, Panama, and the Dominican Republic to develop a subregional project proposal for the creation of a training system for nonprofessional personnel in the water and sanitation sector.

Strengthening of operation and maintenance is one of the main objectives of a project being carried out by the Inter-American Development Bank, the Peruvian Government, and PAHO through CEPIS. The project is for technological development of institutions responsible for drinking water supply and sewerage and the treatment of wastewater. Known as

DTIAPA, it aims to establish and promote the application of practices and procedures appropriate to the socioeconomic conditions of the countries—particularly in the Andean subregion, where it is being applied first—that will permit rural and urban institutions to provide better service (see pp. 36–37 and 63–65).

German Technical Cooperation Agency

The Cooperative Project between PAHO and the German Technical Cooperation Agency (GTZ), which began in 1980, continued in Bolivia, Haiti, and Paraguay and was projected to cover Honduras and the Central America Training Project.

In *Haiti*, activities centered around sectoral planning, community participation, human resources, and planning in relation to the Water Decade. Future activities will focus on institutional arrangements and development of the Central Autonome Métropolitaine d'Eau Potable (CAMEP) and the Service National d'Eau Potable (SNEP), health education, operation and maintenance, consolidations of proposals for Decade planning, Decade workshops, and preparation of the Decade sector plan.

In *Bolivia*, proposals for Decade planning centered on community participation, human resources, urban and rural appropriate technology, water quality control, project identification, investment programs, definition of Decade goals, and institutional reordering and strengthening. Preparation of the national sector plan by the National Action Committee, with PAHO staff cooperation, will be the main focus of future efforts.

In *Paraguay* studies were made of the national situation in regard to operation and maintenance of systems, technical documentation and management information systems, the supply of water to rural areas, and preparation of the national sector Decade plan. Future activities will involve a concentration on community participation, institutional arrangements, human resources, wastewater technology, and information systems.

A subsequent phase of the GTZ-PAHO cooperative program has included the initiation of operations in *Honduras*. PAHO staff collaborated with nationals there in preparation of the plan of operations for the project and in discussion of its management. The country is organizing a National Action Committee to include the Government Planning Office and the Ministries of Health, Government, and Justice. A Decade workshop was held and proposals drawn up regarding the goals, coverage extension programs, information exchange, and institutional arrangements as well as for planning, human resources, community participation, and health education.

GTZ and IDB are jointly sponsoring a Central America and Panama Training Project, with PAHO acting as executing agency, that has been created by that subregion's Association of Managers of Water Supply and Sanitation Agencies; the Dominican Republic has been invited to join the Association and participate in its activities.

Canadian International Development Agency

In 1980 a memorandum of understanding was signed between PAHO and CIDA, extending the Caribbean Basin Water Management project with a budget of C\$370,000. During 1980, 1981, and 1982 an intensive program of activity has been carried out to build the components of the training delivery system, improve trainers' skills, and consolidate arrangements with local training institutions.

Environmental health protection staff also collaborated with CIDA and other agencies such as the International Reference Center in The Hague and WHO in the evaluation of the above project in 1981 and prepared a proposal for its continuation. In a subsequent phase of the project, there will be greater indigenous participation mainly through strategic planning involving all participating countries, country funding of the project, and the services of an indigenous project manager. CIDA will likewise be providing financial support to this project phase.

International Development Research Center of Canada

The IDRC has offered invaluable collaboration to two major environmental health programs in the Region: a study of the health implications involved in the utilization of oxidation ponds as an economical solution for sewage treatment in developing areas, using the San Juan Stabilization Ponds as the experimental station; and the Pan American Network for Information and Documentation on Sanitary and Environmental Engineering (REPIDISCA).

United States Agency for International Development

Environmentalists at PAHO maintain a close relationship with the USAID Office of Health in the Bureau for Science and Technology, as well as with its Water and Sanitation for Health (WASH) project, for the purposes of exchanging information and technical material, and of benefiting from the participation of its staff in regional training activities.

PAHO initiated collaboration with USAID in 1981 in the development of design criteria and curves for a hydropneumatic pumping device, on the basis of a working model constructed by PAHO. Refinement and large-scale testing are to be carried out under the WASH project. Similar collaboration was initiated for a nonmechanical accumulator-pressure relief valve.

Inter-American Association of Sanitary and Environmental Engineering

The Organization collaborates closely with the Inter-American Association of Sanitary and Environmental Engineering (AIDIS) to ensure that the best available resources, experiences, and materials are publicized and shared among those working in environmental health protection. Through AIDIS, which includes engineers working in the public and private sectors throughout the Americas, the countries of the Region can keep abreast of developments ongoing worldwide—which makes the Association an important mechanism for the cross-fertilization of ideas.

Direct support and participation was given to realization of the XVIII AIDIS Congress, held in Panama City in August 1982 on the subject of “Sanitary Engineering and Development of the Americas.”

Other activities planned for 1982-1984 include: an inventory of environmental manpower agencies, materials, and resources; studies on how to modify current education and training practices for engineers and operational level technicians in order that they more realistically reflect locally available resources and facilities; and the dissemination of technical information through AIDIS journals, congresses, and national seminars.

United Nations Environment Program

PAHO actively collaborated with the United Nations Environment Program in the formulation of the Action Plan for Environmental Management in the Wider Caribbean. The Caribbean Action Plan was conceived at the initiative of several Caribbean countries to stress the importance of environmental management in the Caribbean. A joint UNEP/ECLA project was development of a Plan of Action in close collaboration with the specialized agencies and the governments of the area.

PAHO prepared the overview of a document on environmental management in the Caribbean as a basis to determine priority actions for con-

sideration in the Action Plan. Organization staff also participated in meetings of Government-nominated experts held in Venezuela and Nicaragua as well as in an inter-governmental ministerial meeting on the Action Plan for the Caribbean Program in Montego Bay. Project proposals were also prepared for the participation of PAHO in the implementation of the Action Plan.

The Organization participated in several inter-agency meetings, including one on review of WHO/UNEP health-related environmental monitoring projects.

CEPIS is cooperating with UNEP in information exchange through use of the Program's INFOTERRA system and the Center's Pan American network for information and documentation on sanitary engineering and environmental sciences (REPIDISCA). Meetings were held with CEPIS to promote further support between the two programs.

PAHO collaborated with UNEP and CARICOM in the development and implementation of a project on coastal water management for islands in the Caribbean and in the study on human health effects of pesticides in the Caribbean. With the participation of UNEP and UNDP, Trinidad and Tobago received technical assistance for analysis of swine waste management systems. The Organization also concluded an agreement with UNEP to coordinate the planning and execution of human environment activities in the Region.

United Nations Children's Fund

In the environmental health field, PAHO and UNICEF have been cooperating at the country level for over 15 years in several areas—safe water supply and excreta disposal, solid waste disposal, institutional development, and appropriate technology.

UNICEF is currently providing cooperation for drinking water and sanitation projects in 25 countries of Latin America and the Caribbean.

Recent collaboration between the two organizations in the field of water supply and sanitation included analysis of mixed health programs for Dominica, El Salvador, Guatemala, Jamaica, and Paraguay, as well as the exchange of experience in relation to programs in Bolivia and Colombia. Moreover, both organizations collaborated in a project sponsored by the World Bank in Paraguay to extend coverage of its program to the rural supply of water.

As part of the PAHO/UNICEF project on dental care in Cuba, a program to fluoridate public water supplies to prevent dental caries was carried out

in eight cities by the end of 1980, and it was expected to be extended to five more cities to benefit 50,000 inhabitants during 1981-1982.

In connection with the International Drinking Water Supply and Sanitation Decade, both organizations collaborated in the development of a workshop on drinking water supply and sanitation in rural and periurban areas in the Americas, conducted in Lima at CEPIS in November 1980. On that occasion recommendations were adopted on various subjects of importance to the Decade, including the direction of future actions to develop forms of cooperation and financing among governments, UNICEF, and PAHO.

The two organizations have also given increasing attention to stepping up mutual collaboration in relation to water supply and sanitation as well as to multiplying the impact on health of these important services. To that end, representatives of both organizations have been in contact for the purpose of coordinating activities, including a meeting in 1982 of staff from a limited number of training centers with the aim of considering the preparation of a regional project for training intermediate personnel in the operation and maintenance of drinking water supply and sanitation systems that UNICEF will execute with the collaboration of PAHO.

United Nations Development Program

Collaboration between UNDP and PAHO has in recent years included four projects for the development of environmental protection programs in Brazil: a project for the development of environmental pollution research and control for São Paulo State, one for the development of environmental control in Rio de Janeiro State, a project for environmental studies of Lake Paranoá and Descoberto Basins in Brasília, and one on pollution control produced by toxic substances in Rio de Janeiro State. These four projects made an important contribution both to the immediate areas of influence as well as to the country as a whole. They served to identify the main environmental problems that impact on the health of a population; to establish environmental monitoring programs; to identify strategies and programs for control of water pollution in important water basins, as well as for air and soil pollution; and, especially, to develop the infrastructure to study and attend to problems such as institutional and human resource development, particularly of experts and specialists at the professional and technician levels. As a result of these projects there now exist in São Paulo and Rio de Janeiro agencies for environmental control with facilities and laboratories that are well equipped to concen-

trate on these growing problems. The influence of these agencies, moreover, transcends national limits.

The UNDP serves as coordinator of organizations within the United Nations system for the International Drinking Water Supply and Sanitation Decade, especially at the national level where the responsibility has been assigned to the Resident Representative.

The UNDP and PAHO have collaborated in water supply projects in El Salvador and in institutional development of state sanitary works in Uruguay.

PAHO executed a UNDP-funded environmental pollution research project in Venezuela, with the objectives of developing and strengthening the national Directorate for Environmental Research. The Organization contributed to establishment of norms, strategies, and actions for environmental preservation, evaluation of the impact of development on the environment, and investigation of pollution.

United Nations Economic Commission for Latin America

ECLA organized a regional meeting in 1978 as a follow-up of the United Nations Water Conference held in Mar del Plata, Argentina in 1977. In that meeting a Regional Latin American Water Committee was created whose concern was the compliance with recommendations of the Mar del Plata conference, and which was to meet during ECLA regular session periods; in addition, it was recommended that ECLA participate in programs developed by PAHO/WHO of bearing on the Water and Sanitation Decade.

This Committee met for the first time in April 1979 during ECLA's eighteenth period of sessions and on that occasion adopted a work program for the Commission with specific tasks for the Decade, including its participation in the work of PAHO/WHO with the objective of coordinating efforts in the countries of the Region to assure the meeting of the Decade goals. As a result, consultation meetings have taken place among staff of both agencies, for the purpose of dealing with cooperative activities.

The launching of the Decade in the Americas was celebrated in Montevideo in May 1981 at ECLA's nineteenth period of sessions. For that occasion, PAHO and ECLA prepared a joint working document on the prevailing conditions in Latin America at the outset of the Decade and on future prospects.

As part of those activities PAHO cooperated with ECLA in the preparation of a document on the financial needs of Latin America to meet the

goals of the Decade. PAHO also participated in the planning of the First and Second Latin American Seminars on Horizontal Cooperation for the Decade (March 1981 and January 1982), whose purpose was to identify and define criteria, mechanisms and proposals for activities of technical cooperation among developing countries (TCDC) in relation to water supply and sanitation.

The two seminars stressed the importance of horizontal cooperation as a precondition to achievement of the objectives of the Decade. A number of recommendations were approved in regard to strategies for horizontal cooperation, including: that governments accelerate the pace of development of their water supply and sanitation programs, that national action committees be formed and linked to similar subregional committees, that the various existing subregional organizations be taken advantage of as vehicles for horizontal cooperation among the countries, that an exchange program of students in water supply and sanitation be created among the countries of the Caribbean and Latin America, that all documents prepared by the UN system be translated into all the languages of the Region, that the countries establish a focal point to make effective the exchange of information as part of REPIDISCA. In connection with the stress on technical cooperation among developing countries, the participants mentioned various of the "supply" and "demand" facilities and needs that each of the countries has. From this listing, it is obvious that the areas of major horizontal cooperation are planning for the Decade, institutional aspects, technological aspects, water resource utilization, operations and maintenance, rural water and sanitation, human resources, information systems, and financing.

United Nations Educational, Scientific, and Cultural Organization

In collaboration with the Government of Cuba and UNESCO, PAHO has participated in the formulation of a project on control of marine pollution in Cuba and provided technical assistance in the development of methodologies for evaluating pollution.

United Nations Food and Agriculture Organization

At the regional and country levels collaboration with the Food and Agriculture Organization expanded, particularly in relation to the preparation of national programs for food protection. Cooperation continues

with the development and distribution of food standards, particularly in accordance with the FAO/WHO Codex Alimentarius.

International Labor Organization

The Organization coordinates its efforts in occupational health with other agencies having responsibility for activities in this field, particularly the International Labor Organization. In late 1980, PAHO sponsored a workshop on occupational health programming in Lima for representatives of the countries as well as international agencies, including ILO. Discussions emphasized the emergence of occupational health as a growing concern in the hemisphere, the need to evaluate the impact on national economies of work-related diseases and accidents, and the urgency of cooperation among international agencies to effectively support national programs.

European Economic Community

Preliminary arrangements were made to request funding from the European Economic Community for an integrated diarrheal disease prevention and control project. For that purpose, an epidemiologist-engineer team looked into means of including environmental sanitation as part of primary health care activities in the Andean subregion (see page 39).

Organization of American States

PAHO has recently collaborated with the Organization of American States in several aspects of environmental health.

The Inter-Agency Committee on Human Settlements in Latin America has met four times in the past few years, with a representative of the OAS presiding, for the purposes of exchanging information and experiences in the field among agency members that include the United Nations, the Inter-American Development Bank, the United States Agency for International Development, the OAS, and PAHO. In addition, PAHO presented a document at the Sixth Inter-American Conference of Ministries of Work, sponsored by the OAS, on regional health conditions and work safety. The Organization also collaborated closely in OAS activities of the Fund for Assistance in Emergency Situations (FONDEM) related to rehabilitation and reconstruction following natural disasters.

PAHO has cooperated with the OAS in the preparation of an urban solid waste program in Venezuela.

In 1980, PAHO staff members attended meetings in San Juan, Puerto Rico, and in Barbados—both sponsored by the OAS—held to formulate a plan for protection of the Caribbean islands against the contingency of oil spills and to consider the measures to be taken should one occur.

Caribbean Community Secretariat

Environmental health protection staff closely collaborated with CARICOM in the development of the environmental health strategy for the Caribbean which resulted in joint organization of a Caribbean conference on the subject. The strategy provided a framework on the basis of which governments in the area could improve their environmental health services.

PAHO sponsored and participated in the feasibility study for the creation of an environmental health institute in Saint Lucia. The Organization also participated in various meetings of the Advisory Council to the Environment for the Caribbean.

Staff collaborated with CARICOM on several studies conducted in the Caribbean including water supply, solid waste, and particularly in a project for coastal water management.

Food protection staff provided technical input to the establishment by the Ministers of a policy on food safety. This policy has resulted in the calling for a conference on food safety, which has been given the responsibility of planning the overall strategy for the CARICOM food safety program.

PAHO also provided assistance to CARICOM in the preparation and implementation of a workshop on occupational health held in Guyana to review the situation in the Caribbean and prepared recommendations to the governments. Assistance was also provided to develop a document for an occupational health project for the Caribbean countries.

Caribbean Development Bank

The Organization recently collaborated with the Caribbean Development Bank in several environmental health sector studies and project identification missions, particularly in St. Vincent, Grenada, St. Kitts, and the British Virgin Islands.

A course in project preparation for water supply and sanitation was

jointly sponsored. PAHO staff has also initiated discussions with the Bank on a proposal for a jointly sponsored meeting on financing of water and sanitation projects, particularly in the context of the Decade.

The Bank also collaborated in the Caribbean Basin Water Management project by providing resources for leak detection and other training programs in the Caribbean. Discussions were held in order to transfer the management of this project to indigenous authorities, to assure its becoming self-sustained.

Ministers of Health of the Andean Pact Countries

In compliance with a resolution resulting from a meeting of representatives of the member countries of the Hipólito Unanue Agreement, priority continues to be given to the solution of environmental health, occupational health, and environmental pollution problems—which in a similar way affect all the countries of the Andean subregion. An Environmental Health Advisory Committee was created, one of the main objectives of which was to formulate a Basic Sanitation Plan for the subregion, which was approved in 1980.

In 1981, the Eighth Meeting of Ministers of Health of the Andean Area, held in Caracas, Venezuela, passed a resolution emphasizing the importance of occupational health programs in the health policies of the member countries and updating legislation on this area; the Meeting also requested that PAHO/WHO elaborate modular courses for physicians working in businesses, workers, and union leaders. Another resolution aimed at intensifying the distribution of health benefits in the control of diarrheal diseases, while a third provided indication of preparatory health measures to be taken in case of disasters. PAHO Country and Area Representatives have cooperated in the holding of these meetings as well as in preparation of the respective documents.

In November 1981 the Organization held a meeting in Lima of Directors of Basic Sanitation and of PAHO Area IV Engineers (i.e., those located in Bolivia, Colombia, Ecuador, and Peru), which also included participation of the Executive Secretary and staff of the Hipólito Unanue Agreement, with the intention of strengthening activities in regard to the Water and Sanitation Decade and other basic environmental health programs in the Andean countries. Principal among the resulting resolutions were: promotion of a project to improve public sanitation in cities with more than 500,000 inhabitants, emphasizing technical cooperation among developing countries; follow-up of efforts to obtain financing for

the Basic Sanitation Plan of the Andean subregion; and formulation of appropriate technology research projects.

Ministers of Health of Central America and Panama

The Meetings of Ministers of Health and of Directors-General of Health of Central America and Panama, held in Tegucigalpa in 1980 and in Managua in 1981, adopted several resolutions aimed at strengthening environmental health activities in the countries of the Central American isthmus. In 1980 the countries were urged to intensify measures for environmental pollution control in a resolution on urban and periurban health problems. The next year, in 1981, the Ministers resolved to support both the establishment of the Coordinating Committee of Directors and Managers of Drinking Water and Sanitation Institutions in Central America and Panama and its Permanent Executive Secretariat, which will have its headquarters for a two-year period in the Costa Rican Water and Sewerage Institute (AyA). They likewise voiced support of the Committee's efforts to carry out a subregional staff training program aimed at pursuing the goals of the Water and Sanitation Decade.

Subsequently, in 1981, the Coordinating Committee met in San Salvador and admitted the Dominican Republic to its membership, and a new Regional Coordinating Committee was established of Directors and Managers of Drinking Water and Sanitation Institutions of Central America, Panama, and the Dominican Republic. That meeting also approved a preliminary document, prepared with PAHO collaboration, for the development of a regional program for the training of technical non-professional personnel, financial arrangements for which are being discussed with the Inter-American Development Bank and the German Technical Cooperation Agency (GTZ).

Pan American Health and Education Foundation

PAHEF decided to broaden its collaboration with the PAHO Textbook Program by extending it to the area of environmental health and sanitary engineering. At its 1977 meeting in Santo Domingo, the Textbook Program Committee recommended inclusion in the program of the following volumes: *Tratamiento y depuración de las aguas residuales* by Metcalfe and Eddy; *Ingeniería sanitaria y de aguas residuales*—including Volume I, *Abastecimiento de agua y remoción de aguas residuales* and Volume II, *Purificación de aguas y tratamiento y remoción de aguas residuales*—by J. M. Fair, J. C. Meyer,

and D. A. Okun; *Cartillas de saneamiento* by the Construction and Sanitary and Environmental Engineering Committee of the Mexican Secretariat of Health and Assistance; and two PAHO Scientific Publications, *Riesgos del ambiente humano para la salud* and *Procedimientos simplificados para el examen de aguas*.

Actions taken by PAHEF and the Textbook Program will make it possible to market the above-mentioned textbooks. An integrated effort is now being sought in order to identify more appropriate channels for distribution of the books, particularly to students. Staff of the Organization and the Inter-American Association of Sanitary and Environmental Engineering (AIDIS) are collaborating in the identification of universities, research centers, independent schools, professional associations, and individuals for whom textbooks in environmental health and sanitary engineering would be of benefit.

In addition, PAHEF—in collaboration with PAHO environmental health protection staff at Headquarters and in the Pan American Center for Sanitary Engineering and Environmental Sciences—has contracted with the countries of Argentina, Chile, Colombia, Costa Rica, and Peru to investigate the disinfection of water and various simple and low-cost devices with emphasis on the operational, administrative, social, and educational as well as technical factors that influence their success in small communities.

Water and Sanitation

Water and Sanitation: Health and Development

The most critical decision that political leaders face today is the allocation of public funds among various program areas. Resources are finite, but demands of the various sectors competing for those resources are seemingly infinite. Progress in development will depend on good judgment in slicing the budgetary pie, firm political commitment to service programs, and national planning for effective utilization of resources.

Developing countries will be weighing the pros and cons of alternate funding appropriations to industry, transportation, power, education, health, and other public services to gauge which combination (and in which proportions) will lead to the greater self-reliance of, and a higher standard of living for, their peoples. Careful consideration should reveal that few development projects have greater potential for directly benefiting the health and socioeconomic well-being of people than public water supply and sanitation services.

Lack of safe water precludes the attainment of health, and water-related diseases prevent access to employment, education, and a decent way of life. In fact, insufficient and inadequate supplies of water are the single greatest barrier to a healthy population and a productive community. In many parts of the world, moreover, access to water is difficult because water resources are limited, and where they exist they are not always equitably distributed. To make matters worse, what quantities do reach users are often contaminated.

Because of the fiscal constraints being experienced by governments, those responsible for development programs will have to show that the expenditures they seek have important productivity potential. Water supply and sanitation—in the words of World Bank President A. W. Clausen—represent “one obvious area in which we can enhance the environment *through* development... [where] the goals of economic development and environmental enhancement coincide.”

Water and Health. As mentioned in the introduction to this publication, the governments of the world have set as their primary goal the attain-

ment of health for all by the year 2000. The process of monitoring and evaluating global strategies to attain that goal is based on a short list of indicators, one of which is "safe water in the home or within 15 minutes' walking distance, and adequate sanitary facilities in the home or immediate vicinity." Recognition of the importance of these services has been echoed in a series of United Nations conferences—on the environment (Stockholm, 1972), human settlements (Vancouver, 1976), and water (Mar del Plata, 1977)—culminating in the launching of the International Drinking Water Supply and Sanitation Decade (1981-1990) at an extraordinary session of the United Nations General Assembly (New York, 1980). The launching affirmed that drinking water and sanitation services are essential for the full development of man as an individual and as an integral part of society, and that all people, whatever their stage of development or socioeconomic conditions, should have access to those services in the quantity and quality required for their basic needs by 1990, if possible.

The framework of the Decade implies recognition of the complementarity of sanitation with water supply and the need to raise levels of basic sanitation by well-defined programs so that the health benefits of water supply developments can be fully realized. To do so, priority attention must be given to the underserved populations, linking as far as possible improvements in water supply and sanitation with other sector developments in health, education, and housing.

Without water supplies and sanitation services, little improvement can be expected in the health and quality of life of approximately 2000 million people in developing countries. In developed and developing countries alike, unless pollution is controlled, water is yet another source of exposure of people to the risks from industrial contamination.

At present, however, the Decade goal of safe water and adequate sanitation is far from being met. In the less-developed countries, some two-thirds of the population does not have reasonable access to a safe and ample water supply.

The tables on pages 24 and 25, give the status of water supply and sewerage service coverage for urban, rural, and total populations in Latin America and the Caribbean in 1980 or latest year for which data are available. In urban areas at the end of 1979, 178 million people had house connections or easy access to water supply systems, and in rural areas only 43 million had these services. Though data about sewerage are more incomplete, the population served is less than 98 million urban and 1.3 million rural residents. Not enough information is available on use by the urban

Status of water supply services in Latin America and the Caribbean, around 1979.
(Population in thousands)^a

Country	Date of data	Total				Urban				Rural							
		Population served				Population served				Population served							
		Popu- lation	House connec- tions	Easy access	Total	%	Popu- lation	House connec- tions	Easy access	Total	%	Popu- lation	House connec- tions	Easy access	Total	%	
Argentina	12/79	26,393 ^b	14,625	1,081	15,706	60	21,557	14,122	66	822	14,944	69	4,836	503	259	762	16
Bahamas ^c	6/75	120	103	14	117	98	120	103	86	14	117	98	—	—	—	—	—
Barbados	12/79	253	230	23	253	100	125	124	99	1	125	100	128	106	22	128	100
Belize	12/77	146	65	31	96	66	80	51	64	27	78	98	66	14	4	18	27
Bolivia	9/76	4,611	513	1,297	1,810	39	1,925	478	25	1,099	1,577	82	2,686	35	198	233	9
Brazil	12/76	109,355	53,022	16,018	69,040	63	66,257	49,398	75	—	49,398	75	43,098	3,624	16,018	19,642	46
Chile	12/79	11,059	7,676	680	8,356	76	8,427	7,452	88	373	7,825	93	2,632	224	307	531	20
Colombia	12/79	25,000	14,944	1,000	15,944	64	16,000	12,910	81	1,000	13,910	87	9,000	2,034	—	2,034	23 ^d
Costa Rica	12/79	2,162	1,686	55	1,741	81	995	974	98	20	994	100	1,167	712	35	747	64
Cuba	12/78	9,690 ^b	5,983	—	5,983	62	6,260	5,743	92	—	5,743	92	3,430	240	—	240	7
Dominican Republic	6/76	4,835	1,804	928	2,732	57	2,264	1,494	66	498	1,992	88	2,571	310	430	740	29
Ecuador	12/79	7,718	2,820	1,097	3,917	51	3,753	2,661	71	692	3,353	89	3,965	159	405	564	14
El Salvador	12/79	4,379	1,246	843	2,089	48	1,822	1,108	61	110	1,218	67	2,557	138	733	871	34
Guatemala	12/79	6,992	1,428	1,536	2,964	42	2,537	1,284	51	984	2,268	89	4,455	144	552	696	16
Guyana	12/79	838	527	253	780	93	278	257	92	13	270	97	360	270	240	510	91
Haiti	12/79	5,000	305	294	599	12	1,300	302	22	276	578	45	3,700	3	18	21	1
Honduras	12/79	3,592	977	989	1,966	55	1,252	627	50	518	1,145	91	2,340	350	471	821	35
Jamaica	9/76	2,091	1,125	590	1,715	82	620	618	100	2	620	100	1,471	507	588	1,095	74
Mexico	12/77	61,974	34,610	1,750	36,360	59	39,881	27,430	69	1,750	29,180	73	22,093	7,180	—	7,180	32
Nicaragua	12/79	2,542	893	272	1,165	46	1,295	822	63	226	1,048	81	1,247	71	46	117	9
Panama	12/77	1,797	1,074	409	1,483	83	929	866	93	63	929	100	868	208	346	554	64
Paraguay	12/79	2,973	395	440	835	28	1,100	350	32	300	650	59	1,873	45	140	185	10
Peru	12/79	17,698	7,319	1,321	8,640	49	9,580	6,514	68	1,054	7,568	79	8,118	805	267	1,072	13
Suriname	12/79	420	237	122	359	85	240	192	80	48	240	100	180	45	74	119	66
Trinidad and Tobago	12/73	1,084	553	412	965	89	366	285	78	35	320	87	718	268	377	645	90
Uruguay	12/79	2,903	2,075	183	2,258	78	2,344	2,012	86	172	2,184	93	559	63	11	74	13
Venezuela	12/76	13,307	7,753	3,000	10,753	81	9,566	6,000	63	3,000	9,000	94	3,741	1,753	—	1,753	47
Eastern Caribbean																	
Dominica	12/79	80	22	47	69	86	23	12	48	12	24	100	57	10	35	45	79
Guadeloupe	12/75	213	75	—	75	35	...	...	...	...	...	...	213	75	—	75	35
Montserrat	12/76	14	12	1	13	93	2	2	100	—	...	...	12	10	1	11	92
St. Kitts	12/75	38	14	24	38	100	14	8	57	6	14	100	24	6	18	24	100
Virgin Islands (UK)	12/79	10	5	—	5	50	5	5	100	—	5	100	5	—	—	—	—
Total		329,287	164,116	34,710	198,826	60	200,917	144,204	72	13,115	157,319	78	128,370	19,912	21,595	41,507	32

— None.

... Data not available.

^a Current estimates of population served as received from the countries by PAHO/EHP.^b Current U.N. midyear population estimate.^c Island of New Providence only.^d House connections only.

Status of sewerage services in Latin America and the Caribbean, around 1979.
(Population in thousands)^a

Country	Date of data	Total			Urban			Rural		
		Population	Population served		Population	Population served		Population	Population served	
			No.	%		No.	%		No.	%
Argentina ^b	12/79	26,393	7,209	27	21,557	7,209	33	4,836	—	—
Bahamas ^c	6/75	120	14	12	120	14	12	—	—	—
Barbados	12/79	253	...	...	125	...	...	128	...	...
Belize	12/77	146	5	3	80	4	5	66	1	2
Bolivia	9/76	4,611	892	19	1,925	892	46	2,686	—	—
Brazil	12/76	109,355	22,752	21	66,257	22,752	34	43,098	—	—
Chile	12/79	11,059	5,266	48	8,427	5,261	62	2,632	5	0
Colombia	12/79	25,000	11,441	46	16,000	10,850	68	9,000	591	7
Costa Rica	12/79	2,162	428 ^d	20 ^d	995	428	43	1,167	...	...
Cuba ^b	12/78	9,690	3,155	33	6,260	2,915	46	3,430	240	7
Dominican Republic	6/76	4,835	1,030	21	2,264	600	27	2,571	430	17
Ecuador	12/79	7,718	3,115	40	3,753	2,690	72	3,965	425	11
El Salvador	12/79	4,379	854	20	1,822	854	47	2,557	—	—
Guatemala	12/79	6,992	854	12	2,537	854	34	4,455	—	—
Guyana	12/79	838	119	14	278	119	43	560	—	—
Haiti	12/79	5,000	95	2	1,300	—	—	3,700	95	3
Honduras	12/79	3,592	538	15	1,252	537	43	2,340	1	0
Jamaica	9/76	2,091	153	7	620	133	21	1,471	20	1
Mexico	12/77	61,974	16,483	27	39,881	16,390	41	22,093	93	0
Nicaragua	12/79	2,542	403 ^d	16 ^d	1,295	403	31	1,247	...	...
Panama	12/76	1,797	1,563	87	929	903	97	868	660	78
Paraguay	12/79	2,973	260	9	1,100	260	24	1,873	—	—
Peru	12/79	17,698	5,269	30	9,580	5,256	55	8,118	13	0
Suriname	12/79	420	87	21	240	87	36	180	—	—
Trinidad and Tobago	12/73	1,084	292	27	366	252	69	718	40	6
Uruguay	12/79	2,903	1,446 ^d	50 ^d	2,344	1,446	62	559	...	...
Venezuela	12/76	13,307	5,267	40	9,566	5,000	52	3,741	267	7
Eastern Caribbean										
Dominica	12/79	80	...	...	23	...	...	57	...	...
Guadeloupe	12/75	213	...	...	...	—	—	213	...	...
Montserrat	12/76	14	—	—	2	—	—	12	—	—
St. Kitts	12/75	38	—	—	14	—	—	24	—	—
Virgin Islands (UK)	12/79	10	—	—	5	—	—	5	—	—
Total		329,287	88,990 ^d	27 ^d	200,917	86,109 ^d	43 ^d	128,370	2,881 ^d	2 ^d

— None.

... Data not available.

0 = Less than 0.5 percent.

^aCurrent estimates of population served as received from countries by PAHO/EHP.^bCurrent U.N. midyear population estimate.^cIsland of New Providence only.^dProvisional data.

and rural populations of latrines and other individual means of excreta disposal.

Consequently, whereas it is obvious that the countries are making every effort to extend the coverage of services to ever-greater numbers of people, that extension is barely keeping pace with the growth of the population. This will be one of the main challenges to attainment of the goal of the Decade.

The effect of this inaccessibility is evidenced in the high incidence of water-borne and water-related diseases, which in turn are responsible for high infant mortality, low life expectancy, and a poor quality of life. Examples serve best to illustrate the causal relationship between unsafe, inadequate water and disease:

- Gastroenteritis and diarrheal diseases* are largely preventable if safe water and adequate sanitation are made available.
- Typhoid and paratyphoid fever*, which are rampant throughout the developing world, likewise can be traced to contaminated public water supplies and unsafe food.
- Cholera*, which results from contaminated water and inadequate sanitation, leads to fatality in 50 per cent of cases without medical attention.
- Infectious hepatitis* can be spread by contamination of drinking water, as well as of food.
- Amebiasis*, which can be eliminated with clean water supplies and proper excreta disposal, under certain conditions affects more than 50 per cent of the population and, if invasive, can have mortality rates of up to 25 per cent.
- Schistosomiasis*, which is estimated to afflict more than 200 million people, is caused by infection through the skin as a result of working, bathing, washing, or playing in contaminated water. The transmission cycle can be interrupted and the disease could be controlled through adequate disposal of excretas.
- Intestinal parasites* come about through fecal pollution of the soil.
- Malaria, filariasis, yellow fever, and other vector-related diseases* share a common condition—water as the medium in which their vectors breed.

The first mentioned case, gastroenteritis and diarrheal diseases, merits special consideration because of the toll this group of diseases takes on human life—most particularly, infant life. Global statistics show that in 1980 there were over 744 million episodes of acute diarrheal diseases in children under five years, excluding China, and about 4.6 million of these resulted in death. The Inter-American Investigation of Mortality, which compared causes of death in nine American countries during 1968-1971, showed that in one area studied in Latin America deaths from diarrhea in children under five were approximately 1,000 times greater than in a healthy suburb of North America where water and sanitation were “givens”. In another Latin American country, gastroenteritis and diarrhea are by far the most frequent causes of hospitalization for children, accounting for 50 per cent of the cases among babies under 1 year old and

24 per cent among children between the ages of 5-14. Intestinal parasites and infections in that same country account for 31 per cent of cases of health center consultation.

As a group, then, the gastrointestinal infections, typhoid and paratyphoid fevers, cholera, salmonellosis, dysentery, and parasitic intestinal infections resulting from lack of safe water and poor sanitary conditions represent a large proportion of the world's communicable diseases. Although a number of improvements may be made in community life, it has been proven beyond a doubt that access to safe water and adequate sanitation effectively interrupts the transmission of many communicable diseases. A WHO Scientific Working Group has concluded that the long-term prevention of diarrheal diseases—as mentioned above, a major killer in many developing countries—rests largely on the provision and use of adequate facilities for safe water and excreta disposal. This is often readily apparent to community members, who in many instances are the first group to realize the link between unsafe water and disease and death. One case study showed that in Mexico the women of Cham Kom noted an increase of diarrheal disease after a water pump broke down; they complained to the mayor that their children were becoming ill and that the pump had to be fixed; it was, and the children got well again.

In regard to the effect of preventive environmental measures, the example of one Central American country, Costa Rica, demonstrates this correlation convincingly. It is known that there has been a dramatic drop in mortality from enteric and other diarrheal diseases over the last several decades and since the initiation of environmental control efforts through improvements of water supply and sanitation facilities. Other interventions, of course, occurred during such a long period of time, but there is a clear inverse relationship of water supply and death rate from enteritis/diarrhea which, over a 20-year period, fell from the number one cause of death to number nine. Preliminary studies on other countries suggest that similar correlations prevail.

Water and Development. Water is not only essential for health but also for industrial development and increased food production. While its role in industrialization is more that of a catalytic agent or a service than of a raw material (only a relatively small amount of the water used by industry enters the final manufactured product), it should be safe from a health point of view, meet required levels of quality, be available in adequate quantities, and prove reliable.

Yet water is a scarce resource. Shortages of it for domestic, industrial,

and agricultural purposes are becoming frequent in most parts of the world. Moreover, the introduction of piped water supplies increases consumption, and industries then tend to demand an ever-greater share.

To aggravate the problem of scarcity, in many areas of the world water for industrial purposes is wasted or used in excess of actual needs. Often it is not used efficiently in agricultural operations owing to losses in transit, unsuitable irrigation systems, or lack of institutional coordination. Since irrigation is the principal water user in a great many countries, and since water and land capable of being cultivated are becoming increasingly scarce, there is a special need to achieve greater efficiency in the use of both these resources.

There are also problems in already built water supply and sanitation systems. The production of water by a system that is lost as a source of revenue through leakage, lack of billing, illegal connections, etc. is a major problem in many developing countries; in some instances as much as 60 per cent of the water produced may be lost. As a result, one of the major considerations in assuring the cost-effectiveness of investments in water supply and sanitation systems should be to improve the efficiency in management, reducing the unaccounted-for-water losses. Leakage control makes more water available to meet the ever-growing demand.

Appropriate operation and maintenance of the facilities are also of paramount importance, since as many as 40 per cent of village water supply systems may be partially or totally out of use after the first few years of operation if these areas are neglected.

The increased demand for water for domestic, agricultural, and industrial use means more inter-basin transfers, lowering of ground water levels, and less water for domestic use by an ever-increasing population. Added to all this is the increase in waste discharges without a corresponding increase in treatment facilities which, in Latin America and the Caribbean, has resulted in extensive pollution of most water courses. It is estimated that with present trends the demands for water supplies and the volume of wastes discharged from each of the metropolitan areas in the Region will about triple by the year 2000.

In most developing countries little attention is being given to waste treatment facilities because of the high costs and other priorities for the limited financial resources available. Quantitative information on water pollution and water quality in Latin America and the Caribbean is very limited; nevertheless, qualitative studies and the quantitative information available indicate that water pollution is increasing significantly. Over 100 million people with or without water supply and no sewerage service

are adding to environmental degradation in general and to water and soil pollution in particular.

The studies carried out show that in most Latin American cities with populations of over one million, serious water pollution problems already exist to varying degrees. In the majority of cases, competing water uses are water supply, waste water assimilation, and recreation. Of the cities studied, most affect large bodies of water, smaller rivers and groundwater. Although water pollution is not limited to major cities, they are associated with the most important problems in this regard.

Among the major investments being made in the developing world is investment for hydroelectric power development. In part this is due to rapidly increasing demands for electricity and the substantial increases in the cost of energy as well as the increasing demands for irrigated land and water supplies. It is estimated that in Latin America, for instance, the hydroelectric generating capacity will expand at the rate of 8.2 per cent per year between now and the year 2000. As this development is carried out, consideration will have to be given to the human health implications of the development process—such as the introduction of schistosomiasis and other health risks. Health needs and protective measures should be made integral parts of development projects—irrigation schemes, dams, and industrial development activities—in developing and developed countries alike, taking account of their cost-effectiveness.

Thus the linkage between water supply/sanitation and development poses some problems, the solution to which will require the educating of policy- and decision-makers in the countries as to the advantages and benefits to be derived from providing these services, as well as the price to be paid if they are not extended to the community.

In addition to the patently obvious health benefits described in the previous section, the development *per se* returns on an investment in water are many, such as:

- The construction of water supplies can result in municipal improvements that in turn lead to increased property values.
- Safe water supplies may result in a reversal of the trend away from agriculture, if national governments interested in diversifying their economies look at development of the agricultural industry; providing the basic necessities of a better standard of living, such as safe water, is an encouragement to keep people in rural communities.
- Water supply is an important factor in the location of an increasing number of new or expanding industries and even in the relocation of existing ones experiencing the problem of inadequate quantity or quality of water and rising costs.
- Besides its importance as a prerequisite service to other industries—such as agrobusiness, fish freezing, adobe manufacturing, etc.—water can play an important

role in stimulating the wide variety of industries which are needed for the water supply systems themselves: the manufacture of pipes, plumbing fixtures, pumps, etc.

- Community involvement in the constructing, operating, maintenance, and funding of water systems should strengthen village institutions and help villagers get involved in overall development. The organizational patterns created for one project—the committee and the arrangements for voluntary labor—as well as the enthusiasm generated by one success, can be expected to be applied to further efforts to tackle other needs. Many advocate community participation because a success in providing water supplies will induce community members to undertake other development tasks, leading to community motivation and institution building.

Water: The Linkage with Health and Development. While access to safe drinking water and sanitation have been proven to be essential to good health and while the availability of water is a requisite of socioeconomic development, there also exists a cause-and-effect relationship between water, health, and development. Participants at the United Nations Water Conference recognized that these three elements form a complex system which will in large part decide the course of future events: “The accelerated development and orderly administration of water resources constitute a key factor in efforts to improve the economic and social conditions of mankind, especially in the developing countries; it will not be possible to ensure a better quality of life and promote human dignity and happiness unless specific and concerted action is taken to find solutions and to apply them at the national, regional, and international levels.”

Looking at this relationship in terms of socioeconomic development, water-related illness can be perceived as the loss of a resource. If a money value could be assigned to the output that this loss represents, it would be equal to the increase in output that would occur if the loss of resources due to diseases were eliminated. In the case of water-related illnesses, that foregone output is tremendous. Moreover, great costs are entailed in the share of a nation's resources—manpower and material—used to supply the health services and ancillary components necessary to attend to water-related diseases.

This does not mean that the value of human life should be ignored. It is of course unacceptable to view additions to the national income as the sole or principal economic benefit of a water supply program. A healthy child can hardly be viewed as an object of investment. The case for what the World Bank has termed “human development”—health care, education, and fertility reduction so that poor people can help themselves—is not only, or even primarily, an economic one. Less hunger, fewer child deaths, and access to education and employment are almost universally accepted as important in themselves.

Still, it should be remembered that there are as many benefits—not only in health, but in socioeconomic development as well—as costs related to water supply and sanitation. People who are unskilled and sick make little contribution to a country's economic growth. Development strategies that bypass large numbers of people may not be the most effective way for developing countries to raise their long-run growth rate. Due consideration should be given to the assurance of health, especially through provision of safe water, in the pursuit of socioeconomic progress. Supply of the resource and assurance of human health should properly be viewed as both means to raise incomes and as ends in themselves.

PAHO Activities and the Decade

The approach to the International Drinking Water Supply and Sanitation Decade developed by the Organization is based on the strategy for health for all by the year 2000, as outlined in the Regional Plan of Action (see inset). It includes the following:

- Complementarity of sanitation with water supply development;
- Focus on both rural and urban underserved populations in policies and programs;
- Achievement of full coverage through replicable, self-reliant, and self-sustaining programs;
- Use of socially relevant systems applying an appropriate technology;
- Association of the community with all stages of programs and projects;
- Close relation of water supply and sanitation programs with those in other sectors;
- Association of water supply and sanitation with other health programs.

Plan of Action

DRINKING WATER AND EXCRETA DISPOSAL

Approaches

The Plan of Action is directed to improving and expanding the drinking water supply and excreta disposal services. Emphasis should be placed on activities to provide safe drinking water and adequate sanitation services to the greatest possible number of inhabitants by 1990, in accordance with the International Drinking Water Supply and Sanitation Decade, and to extend this coverage to all by the year 2000. Providing

these services will be an important complement to those activities concerned with the control of diarrheal and preventable diseases and the improvement of nutrition.

The strategy for implementing the action proposed includes the integration of water supply and sanitation development projects as primary health care components; and mobilization of local and national support for implementing national plans and obtaining external financial support. High priority will be given to operation and maintenance, which will include carrying out studies of unaccounted-for losses in distribution systems; identifying critical parameters to monitor water quality; establishing water conservation practices; developing and improving national agencies; developing human resources; and extending and upgrading laboratory facilities.

Areas of Action

1. Strengthening policies and planning.
 - Integration of drinking water and excreta disposal projects as fundamental elements of national development plans.
 - Establishment of intersectoral coordination mechanisms.
2. Promotion and strengthening of countries' institutional capacity to manage and operate water and wastewater disposal systems.
 - Formulation of guidelines for establishing and strengthening institutions.
 - Development of organizational and management information systems to improve institutional efficiency in using operational resources and expanding installed capacities.
 - Development of technical, managerial, and operational capabilities of the required human resources.
3. Improving quantity and quality of water as well as water systems management.
 - Reduction of unaccounted-for losses in water systems.
 - Development of minimal standards of quality, quantity, and continuity of service.
 - Improvement in national capability to monitor water quality.
4. Promotion of the participation of the health sector in the development and implementation of programs and projects.

- Program and project identification and preparation.
 - Obtaining financial support for project preparation and implementation.
 - Formulation of financial policies reflecting goals and users' ability to pay.
 - Increase of non-governmental financing of sector activities.
5. Promotion of technology development and utilization.
- Development of new technologies and adaptation of known technologies at national institutions, and intercountry exchange of information.
 - Development of local capabilities for the manufacture of materials and equipment.
6. Participation of the community.
- Formulation of guides for community participation and education.
 - Assessment and formulation of guides for establishing operational links with primary health care so that sector work and primary health care activities are mutually supportive.
7. Development of human resources.
- Strengthening training for managers, designers, and operators of water systems, including community agents.

Suggestions for Indicators

- Number of projects identified and implemented which include the infrastructure for proper operations and maintenance and to provide water of acceptable quality.
- Population served by different levels of services.
- Number of samples collected and analyzed that indicate water to be of acceptable quality.

Activities at the Regional Level

In the Technical Discussions of the PAHO Directing Council held in 1979, strategies recommended for the extension and improvement of water supply and sanitation services during the 1980s specified: obtaining support at the highest level of government for the extension of basic

sanitation services, as an essential element of national development plans; compiling, analyzing, and disseminating detailed information on the drinking water supply and sanitation sector for the preparation of plans, programs, and project development; overcoming institutional difficulties at every level; improving the coordination of responsibilities among agencies; elaborating national systems for staff development; and tackling economic and financial restrictions.

For the purpose of putting into practice these strategies, the PAHO water supply and basic sanitation program concentrates on four kinds of activities: cooperation with the countries in preparation for the Water and Sanitation Decade; identification and development of programs and projects for presentation to financial institutions; execution of activities aimed at improving human resources in the sector in terms of quantity, kind, and quality; promotion of the development of institutions; and development of projects to improve the quality of drinking water and sanitation services.

Seven governments have created national action committees for the Decade through legislation, and another five have established less formal mechanisms. In several countries, efforts have been carried out to create interagency technical support committees consisting of UN agency representatives in the countries in coordination with the UNDP Resident Representative; greater attention needs to be given, however, to a better coordination of international activities at the country level.

PAHO is promoting and collaborating in the reorientation of sector planning toward the objectives and goals of the Decade. As part of this approach, an interregional project is being executed in the Americas aimed at Decade planning, based on an agreement between the German Technical Cooperation Agency of the Federal Republic of Germany (GTZ) and WHO (see chapter on horizontal cooperation).

WHO and PAHO have prepared Decade activity guides on the principal areas of interest of international and national staff. These include guides for the preparation of rapid assessment reports, sector planning, project and program information, a catalog of information on external agencies and others. UNDP has prepared guides for the establishment of national action committees for the Decade and technical support groups comprising the staff of UN agencies at the country level. In addition, the Organization plays an important role in channeling external resources in support of national activities.

In several countries—Argentina, Bolivia, Colombia, Guatemala, Guyana, Jamaica, Nicaragua, and Peru—working meetings and national

seminars have been organized, with PAHO collaboration, under the sponsorship of the national action committees, governmental agencies, universities, and other institutions aimed at promoting Decade activities. This effort has served to create an awareness of the sector situation and the need to establish strategies for national action.

The Decade has also been a main theme in meetings held at the subregional level. The countries of the Andean Pact dealt with the subject of the Decade in the First Meeting of the Advisory Committee on Environmental Health held in Lima in May 1980, which discussed the Subregional Basic Sanitation Plan. The countries in Area I likewise met, in November 1980, for the purpose of discussion of environmental health planning among professionals from the countries of the the English-speaking Caribbean and representatives of the Caribbean Development Bank and USAID. On that occasion specific action guidelines were developed with a Decade orientation. The II Meeting of Directors of Divisions of Environmental Health of Central America and Panama—held in San José, Costa Rica, in January 1981—considered the bases for development of an environmental health staff training program for the countries of the area and strategies to be followed by national environmental health divisions to achieve the Decade goals.

The Inter-American Association of Sanitary and Environmental Engineering (AIDIS) held its XVIII Congress in Panama in August 1982, where some 1,500 professionals discussed the Decade, sanitary engineering, and the development of the Americas. The technical symposium held immediately prior to the Congress and sponsored by PAHO focused on the subject of human resources as a precondition to the achievement of Decade goals (see chapter on human resource development).

With the aim of strengthening the capacity to identify and develop programs and projects, PAHO continued its cooperative program with the World Bank, as explained in the chapter on horizontal cooperation. As part of this program, technical advisory services on water rates were provided to Costa Rica, Panama, and Uruguay. Collaboration was provided in the financial analysis of a sewerage project for Montevideo. Further cooperation was offered to Argentina in the financial analysis of a large water supply project that will be financed by the World Bank.

Since countries' resources vary considerably, PAHO stressed technical cooperation among developing countries, including the establishment of networks of water supply and sanitation institutions that could cooperate in the solution of common problems, the exchange of experiences, and the sharing of resources. This concept was further reinforced with the estab-

lishment of the Association of Directors and Managers of Water Supply and Sanitation Institutions for Central America and Panama, to which the Dominican Republic was added. As a first action measure, a subregional staff training mechanism will be established for which the training center of the National Water and Sewerage Service (AyA) of Costa Rica will be utilized. It is anticipated that financing will be provided by the IDB and GTZ.

PAHO participated actively in both the First and Second Latin American Seminars on Horizontal Cooperation for the Decade sponsored by ECLA. The objective of the First Seminar, held in Santiago, Chile in March 1981, was identification and definition of criteria, mechanisms, and action proposals regarding water supply and sanitation; directors and high-level staff from governmental agencies and water supply and sanitation agencies from throughout South America attended. The Second Seminar, held in Santo Domingo in January 1982, concentrated on the same subject for the rest of the countries of the Region. Both seminars aimed to further activities of technical cooperation among developing countries in the benefit of national Decade programs.

The Pan American Center for Sanitary Engineering and Environmental Sciences (CEPIS) in Lima carries out a number of regional programs to promote the development of water supply and sanitation services, including programs for the improvement of drinking water quality, for extending water services to urban slum populations through reductions in unaccounted-for water, for appropriate technology for the collection, treatment and final disposal of wastewater and excreta for medium and small communities and dispersed rural populations, for strengthening of commercial systems of water supply and sewerage institutions, and for technical and institutional development of the agencies responsible for basic sanitation of nucleated and dispersed rural populations (a description of the first two programs follows; the last three are reported on in the chapters on appropriate technology and institutional development).

The objectives of the *regional program for the improvement of drinking water quality* are to obtain a real decrease of diarrheal and other parasitic diseases caused mainly by deficient quality of drinking water; to promote in the user an improved attitude toward payment for services as a result of improved water quality, thereby making financially viable the objectives of the Water Decade; to make appropriate use of the installed capacity of potabilization plants and water disinfection equipment; to evaluate existing technology with a view toward improving the relation of costs, results, and efficiency. Achievement of these objectives is based on an in-

tensive program for the development of institutions and human resources, following a review of existing problems and programs by a group of specialists, the design and preparation of modular learning cycles, the holding of regional courses and residence programs for trainers, and massive training courses at country-level.

Close to 100 teaching/learning modules have been prepared in 1981-1982, with the collaboration of professionals from more than 15 institutions from some 10 countries of the Region. Regional or subregional courses or workshops have been held, a number of which took place in Peru with others held throughout the hemisphere—Guatemala, Nicaragua, Colombia, Paraguay, Costa Rica. The topics dealt with ranged from general ones—such as development of continuous training systems for water supply and sewerage institutions, and basic concepts for supervisors, operators, and technicians in water supply—to specific aspects—such as predesign of unit processes and preliminary design of treatment plants, as well as operation, maintenance, and evaluation of those plants. Hundreds of professionals from a good representation of the countries have participated in these courses. More than a dozen future trainers for national-level courses spent in-service training residence periods at CEPIS, participating with their colleagues at the Center in the study of specific problems and collaborating in the design and preparation of teaching modules for training courses.

At the same time, various cooperative studies in the area of research and development of appropriate technology have been carried out between CEPIS and country institutions on themes such as modular treatment plants (with Spanish and English versions of the document now ready for printing); sand washing in slow sand filters in rural aqueducts, a project being carried out through collaboration between the Peruvian Ministry of Health and the project for technological development of water and sewerage institutions (DTIAPA); disinfection of water in rural areas, a study being carried out in Argentina, Colombia, Costa Rica, Chile, and Peru with CEPIS advice and coordination through which an attempt is being made to determine the technical, administrative, and socioeducational factors affecting the process; and finally, among others, studies on the socioeconomic aspects and costs of technology involved in activities for the improvement of drinking water quality.

In the dissemination of technical information in this program an intensive gathering and systematization has been carried out of the information used by professionals in those countries which collaborate in the preparation of modules and submodules for the learning cycles. Printing and

distribution of the lectures and chapters that will make up the respective manuals have been effected, and at the same time requests for information in the field from some 20 national institutions in the Region and several international organizations have been answered.

Finally, in the activities of direct technical cooperation in this program area, various requests have been met, among others: in Peru—treatment plants in Ayacucho, Arequipa (La Tomilla), ESAL (Lima), ORDEPUNO, treatment and disinfection of water, laboratories of ESAL in the implementation of its quality control program for drinking water, etc; Colombia (Manizales Public Water Agency, treatment plant in Gallinazo on two occasions); Guatemala (Lo de Coy treatment plant); Nicaragua (Managua), etc.

The *regional program for extending water services to urban slum populations through reductions in unaccounted-for water* has as its purpose to provide service to marginal populations not presently receiving water by sufficiently reducing the size of losses, leakage, and other failures of the distribution and commercialization systems without the need for major new investment.

In the field of development of human resources in this program, activities included a study of the technical material available, an analysis of the predominant technology in several water companies in Latin America, and a visit to SABESP (State Basic Sanitation Company, Sao Paulo, Brazil) for the purpose of defining which would be the most appropriate cycles and contents for courses in this area. A preliminary proposal was the subject of analysis and in-depth discussion at a meeting with a group of PAHO environmental health staff and experts from national institutions, held at CEPIS in November 1981. The five cycles recommended include: basic aspects; evaluation of distribution networks; operation and maintenance of distribution networks; design of water distribution networks; and leakage detection and control.

CEPIS recently offered two courses within this program: measurements and control of water consumption in water supply connections (February 1981); and control and measurement of leakage in drinking water distribution networks (March 1981). A lecture was also given in Lima, on appropriate technology for water supply and sanitation in rural and marginal urban communities to 30 directors of a regional program for community health workers in Peru, and in October 1981 the regional workshop on water supply for urban slum areas was held at CEPIS.

The visit to SABESP targeted analysis of research and technology development needs in the area of unaccounted-for water and the possibil-

ity of a wider dissemination and use of the research done by that agency with respect to materials quality control.

In the area of technical information, staff completed the collection and study of the existing bibliography on control of unaccounted-for water and distribution networks.

For an *integrated project for diarrheal disease prevention and control* PAHO staff worked with representatives of the Andean Pact Hipólito Unanue Agreement on the elaboration of a project proposal to develop and integrate selected primary health care activities, namely drinking water and excreta disposal, control of diarrheal diseases, immunization of children, and control of acute respiratory diseases. With UNICEF support, five Andean countries have already begun to implement oral rehydration techniques in the control of diarrheal diseases, while complementary vaccination and sanitation activities have been underway to varying extents for quite some time. Target project approaches include appropriate technologies in environmental sanitation and diarrheal disease control, development of innovative and more effective methods to extend primary health care, and community participation.

The role of PAHO as executing agency in the proposed four-year project—which, it is expected, will be carried out by the Hipólito Unanue Agreement—would center on: involvement and training of schoolteachers in health education of children and mothers in simple and inexpensive control measures related to diarrheal and respiratory diseases, sanitation and immunization programs; motivation and education of voluntary health workers; development of appropriate technology of health education, sanitation and disease prevention; exploration of various health sector strategies, possibly integrated with those of other social sectors in extending primary health care beyond existing networks with emphasis on public participation; and study of the factors hampering proper maintenance of sanitary facilities.

Activities at the Country Level

The status of water supply and sanitation programs in the countries and specific activities of PAHO technical cooperation are described in the paragraphs that follow.

Barbados. The newly established Water Authority, to which PAHO continued to give assistance, is functioning well. All main sewers are now laid

and provisional arrangements have been made to connect some buildings to the sewerage system. The island continues to participate in the Caribbean Basin Water Management Project; plans have been made to have this project operate with local financing and administration.

Belize. Two major objectives of the national environmental health program are to ensure that the Belizen population is provided with adequate and safe water supply and to provide adequate waste disposal services for both liquid and solid wastes. The government is working steadily towards the improvement of the environment: progress has been made in the development of rural water supplies and sanitation; assistance was provided by PAHO to give training in water facilities operation and maintenance for water and sanitation operators and public health inspectors; this was a priority activity which will enhance proper maintenance of pumps and the monitoring of water quality.

Bermuda. The government is currently engaged in promoting water quality and pollution control; the provision of good quality and adequate quantity of water is a continuous concern of the government in view of the absence of rivers, lakes, and the shortage of land space. The PAHO resident engineer has assisted the government in reviewing its strategy for the improvement of water supplies. A team from the Environmental Health Protection Agency of the United States visited the island at the beginning of 1982 to help the country develop its water quality control program.

Bolivia. PAHO assisted in the preparation of a basic document, the National Environmental Health Plan, the priority program of which is adequate sanitation. PAHO provided support to realization of the cooperative program with GTZ, which is providing funding to promote national Decade planning. With the assistance of international experts, several programs have been prepared: institutional development, community participation, human resources, information, drinking water quality control, appropriate technology, and system operation and maintenance. A planner and financial analyst are aiding in the institutional restructuring and preparation of a "package" of specific projects. A workshop for directors of environmental health agencies provided a forum for discussion of the Decade—goals, policies, and strategies.

Brazil. Assistance was provided for the execution of water supply and excreta disposal systems in the rural area of the northern and north-eastern regions of the country. Cooperation was offered to investigative studies on basic sanitation in the North and Northeast; also recommended in those studies are the formulation of policies, priorities, and development of research projects in sanitation.

Chile. The National Drinking Water Supply and Sanitation Committee has proposed to update the national drinking water plan in accordance with the Decade and to formulate the drinking water program for the rural dispersed population. PAHO also provided assistance to the reinitiation of the water fluoridation program.

Colombia. PAHO cooperated in the implementation of a national program for improving the quality of water, which was begun in 1981 with the collaboration of CEPIS through the holding of courses on evaluation, design, operation and maintenance, and administration of water treatment plants. A National Basic Group is in the process of formation so that Decade activities will have a greater chance of succeeding. PAHO cooperated in the revision of water quality standards for Colombia. The Water and Sewerage Agency (Empresa de Acueductos y Alcantarillado) of Bogotá has signed an agreement with several regional agencies related to the Bogotá River to study the water problems existing in the basin, which at the present time are affecting communities along the river in terms of the overflow of water and the normal drainage of rain water and wastewater produced by the city and dumped in the river. Studies are ongoing on construction of stabilization ponds for treatment of rain water and waste water, for which purpose several national officials visited the stabilization ponds project carried out by CEPIS in Lima.

The Ministry of Health has given its support to the newly launched national program for improvement and control of drinking water quality. The program combines the efforts of INSFOPAL and PAHO, using training modules developed by CEPIS on evaluation, design, operation and maintenance, and administration of water treatment plants. The program also covers Colombian health code regulations and the new water quality standards. A massive training program will be based on three-week workshops to be held throughout the country. In addition to training of water treatment plant operators, the program will focus on house water filters, fluoridation, and leakage control.

Costa Rica. The Costa Rican Water and Sewerage Institute (Instituto Costarricense de Acueductos y Alcantarillado—AyA), which is responsible for all activities related to water supply and sanitation services in urban and concentrated rural areas, is carrying out a drinking water quality control program. AyA is negotiating an agreement with the World Bank for a loan in the amount US\$30 million to finance project Orosí, which will increase the water available in the Metropolitan Area of San José by 1.3 cubic meters per second.

Dominican Republic. The country, through the efforts of INAPA, has for-

mulated a plan to attain the commitments of the Decade. The National Rural Drinking Water Plan (PLANAR) has completed two phases of execution. A loan agreement has been signed with the IDB to execute the third phase in 1982. INAPA has established as first priority the supply of drinking water, and as second the construction of sanitary sewerage systems. PAHO cooperated in the planning and execution of the Interinstitutional Environmental Health Seminar, with a major focus on drinking water and sanitation, where the need for intersectoral coordination was reiterated.

El Salvador. The National Workplan for Environmental Health was restructured in order to provide a new approach which it was hoped would provide better results, particularly in regard to drinking water quality and supply, sanitation, and community education in the use of these services. PAHO collaborated in promotion of the establishment of an Interinstitutional Committee for Water Supply and Sanitation. Information was prepared to formulate a Regional Program on Operation and Maintenance of Water Supply and Sanitation Systems. Staff from the country participated in the Meeting of Water Supply and Sanitation Agency Managers of Central America and Panama.

Guatemala. Efforts are focusing on establishment of sectoral coordination for the planning and execution of programs related to the Decade. A work group consisting of staff from water supply and sanitation agencies was set up to formulate the project for drinking water quality standards. PAHO provided assistance to the Ministry of Public Health and Social Welfare, to the Executive Unit for the Rural Water Program (Unidad Ejecutora del Programa de Acueductos Rurales—UNEPAR), the National Institute for Municipal Development (Instituto Nacional de Fomento Municipal—INFOM, and the Regional Sanitary Engineering School (Escuela Regional de Ingeniería Sanitaria—ERIS) of San Carlos University. The Organization also cooperated in the regional course on evaluation of drinking water treatment plants and in the formulation of a program to monitor the quality of drinking water that covers 760 communities with a population larger than 1,000 inhabitants. Advisory services were provided in the setting of specifications for the construction of rural aqueducts.

Guyana. PAHO helped to organize a seminar on water and sanitation at the beginning of 1981. Staff also participated in a number of meetings in villages with UNICEF and national officials to develop the project proposal for the UNICEF-financed village health water project, which has been submitted to UNICEF headquarters.

Jamaica. Water supply is one of the principal components of the environmental health program. The government has made efforts to consolidate the supply and monitoring of water supply under one authority, the National Water Commission. An intersectoral committee was formed to plan and implement activities for the Decade, with the assistance of the resident sanitary engineer.

Mexico. The National Water Supply and Sanitation Plan was formulated. The Subsecretariat for Improvement of the Environment (Subsecretaría del Mejoramiento del Ambiente—SMA) started a program to certify the quality of water delivered to consumers and continued its water fluoridation activities.

Nicaragua. Staff of the Nicaraguan Water and Sewerage Institute (Instituto Nicaraguense de Acueductos y Alcantarillado—INAA) were trained at CEPIS in technification of drinking water treatment plants. PAHO assisted in the supply of a manual on design of drinking water treatment plants and of laboratory analysis supplies and equipment. A course on predesign of drinking water treatment plants was offered for 30 staff members of drinking water institutions, the health ministry, and the National Autonomous University.

Panama. The extension of coverage and the improvement of quality of drinking water and sanitation are high priority. The extension of rural aqueduct coverage continued: 23,500 more persons were served with the construction of 94 new aqueducts. The impetus for this construction resulted from the efforts of the Ministry of Health's Environmental Health Program and funding from USAID. The quality of water served in the country is excellent. Negotiations have been carried out with the Inter-American Development Bank for the construction and improvement of urban area aqueducts and the construction of new sewerage systems in a number of communities throughout the country. A new treatment plant is being installed in the area of Colón and other important works are being executed with funds from a World Bank loan. These activities should make it possible to attain the goals of the Decade. PAHO cooperated with AIDIS in the organization of the XVIII Inter-American Sanitary Engineering Congress.

Paraguay. PAHO assisted in the execution of two World Bank loans aimed at the construction of rural water supply systems as well as in water supply and sanitation programming related to assistance through the Kreditanstalt fuer Wiederaufbau. The Organization also cooperated in the National Decade Plan with an ad hoc committee set up to draft the plan for which analysis was made of certain basic information, the present

situation of the sector, institutions in the sector, definition of the goals of the Decade in the country, identification of projects, basic study of communities with less than 500 inhabitants, and analysis of operation and maintenance.

Peru. The National Drinking Water Supply and Sewerage Service (Servicio Nacional de Abastecimiento de Agua Potable y Alcantarillado—SENAPA) was given the responsibility of executing the national policy for the development, control, operation and maintenance of urban drinking water and sanitation services, with specific duties in the aspects of planning, programming, financing, standards, preparation of projects, execution of works, advisory and technical cooperation services, supervision of financing, and evaluation of results. Participation of national agencies of the sector in the project for technological development of drinking water and sanitation institutions (DTIAPA) made possible an orientation of the decisions of the Technical Committee which will allow the country to assume responsibility for activities related to human resource development, information, and research in the field. PAHO cooperation in activities carried out as part of the DTIAPA project made possible the participation in the project of national agencies, the identification of their needs and requirements, with emphasis on operation and maintenance, and the establishment of self-reliant national systems and mechanisms.

Suriname. An expert from CEPIS cooperated in the treatment of wastewater. The country benefitted from considerable assistance of the Government of the Netherlands which was earmarked for water supply, sewerage, and solid waste management.

Other Decade-related Activities of the Organization

WHO Decade Project and Program Information System¹

In most countries considerable information and data are available on projects and programs for which external cooperation is required. Unfortunately, often there has been neither the methodology nor the machinery to convey this information speedily to donors and financing agencies. As of April 1981, WHO has launched a project and program information system which offers to governments an option to inform the donors of

¹Full details on the project and program information system, can be obtained by writing to the Manager, Global Promotion and Cooperation for Water Supply and Sanitation Unit, Division of Environmental Health, WHO, Via Appia, 1211 Geneva 27, Switzerland.

needs for increasing external support for the Decade. The projects and programs may cover surveys, studies on construction of water supply or sanitation facilities, training, or any other activity which a country may undertake in the context of the Decade.

The information system is based on data sheets on which the essential information in relation to a project or program is presented by a government wishing to pursue the request with interested external support organizations. The UN agencies participating in the cooperative action and the UNDP Resident Representatives and the Technical Support Teams are ready to cooperate with national organizations in completing and presenting the data sheets. UNDP Resident Representatives, WHO staff at country level, and the program coordinators will assist in establishing a link to interested external support agencies at the country level. In addition, the unit for Global Promotion and Cooperation for Water Supply and Sanitation at WHO Headquarters in Geneva can assist in establishing contacts with official donor agencies, international and regional development banks, and nongovernmental organizations.

Drinking-water and Sanitation, 1981-1990, A Way to Health²

This is a new publication issued by the Organization as a contribution to the International Drinking Water Supply and Sanitation Decade. PAHO has already commenced its Spanish translation, which should be available by year-end 1982. It has been stated that the Decade cannot succeed if the same technology and the same management approach are applied as in the past. The Organization has therefore adopted a "Decade approach," which can be summarized as follows: the Decade must contribute to implementing primary health care; water supply and sanitation development should be complementary and they should be jointly associated with other health development; policies and programs should focus on rural and urban underserved populations; full coverage should be achieved through reproducible, self-reliant, and self-sustaining programs; the people for whom the services are intended should be associated with all stages of program and project development; the Decade should be a matter of collaboration between all contributing sectors.

The introductory chapter of the book sets out the Decade targets and outlines the Decade approach. In the next chapter, various aspects of community water supply and sanitation in the Decade are examined, in-

²Published in English by WHO/Geneva, 1981. ISBN 92 4 156068 1. 56 pages. Price: SW.fr. 9.

cluding the Organization's policy and the relationship between primary health care and the Decade. This chapter also discusses in detail the essential elements of the Decade approach.

A framework for national actions is then put forward, including formal plans and planning processes; community participation in the planning process; the organization of strategy seminars and national workshops; and the importance of communications and education. Decade programs are subdivided into coverage programs and support programs, and the need to strike a balance between the two is emphasized. Coverage programs and support programs are then dealt with in detail, and a final section discusses the role of health agencies in the Decade.

Financing of the Decade

One of the biggest constraints to accomplishment of the Decade goal is the obtaining of sufficient funding to initiate and sustain water and sanitation projects. A great deal of money has already gone into these projects, as evidenced by the following table:

**Funding by International Lending Agencies of
Urban and Rural Water Supply and Sanitation Projects
in Latin America and the Caribbean,
1977-1981 (in US\$ millions)**

	1977	1978	1979	1980	1981*
International Bank for Reconstruction and Development loans	55.2	149.5	169.8	316.0	346.1
Inter-American Development Bank loans	201.3	110.7	86.9	199.55	74.16
Total of IBRD/IDB loans	256.5	260.2	256.7	515.55	420.26
National Matching Funds for IBRD and IDB loans	307.0	1,213.5	349.65	992.67	640.5
TOTAL	563.5	1,474.7	606.35	1,508.22	1,060.76

*National matching funds shown for International Bank of Reconstruction and Development only.

Several basic observations about financing water supply and sanitation projects in Latin America and the Caribbean appear reasonably valid in

most cases.³ In essence, these are that (1) any project requiring construction of facilities will take at least five years to complete; (2) funds allotted for water supply and sanitation that exceed the amounts currently allotted by national or state budgets will probably have to come at the expense of some other government sector; (3) most of the funds must come from within the country, not from international or foreign sources; (4) the most likely source of funding is revenue garnered from fees charged to beneficiaries; and (5) without enough trained workers and managers to effectively operate, maintain, and administer new facilities, there is little chance that the goals established for the 1980s can be met.

Because of the time-lags required to complete projects, those needed immediately should receive priority attention, even if no long-term plans for the 1980s have been produced. The work required to identify priority projects of this kind should be funded out of water and sanitation agencies' normal operating budgets. Further preparatory steps (special studies; specialized planning of organizational, managerial, or financial matters; or resolution of special technical problems) will probably require funds beyond those available from normal operating budgets. However, extensive outside funding (including bilateral funding) is available for such project preparation.

Regarding preparation of a "Decade" plan for financing, the aim of such a plan—containing separate subsector plans for urban water, urban sewerage, rural water, and rural excreta disposal—is to accurately estimate the funds needed each year to attain the desired goals. More specifically, it should show what major allocations are required to cover the costs of constructing new facilities, operating and maintaining existing facilities, and providing major repairs and replacements for old facilities.

For new construction, the foreign exchange needed to buy foreign goods and services can often be covered by loans from bilateral lending sources, multilateral investment sources, and private banks, or through financing provided by the suppliers.

For construction in rural areas it has been common to subsidize such work with national or state funds, and also to borrow funds abroad. This, combined with the difficulty of recovering the costs of investment in rural works, makes it important to ask careful questions about whether these and related costs will be recovered and, if so, how.

³The paragraphs that follow represent the summary of an article by Harold Shipman, formerly Chief Engineer of the Pan American Health Organization, "Strategies for Financing Water and Sanitation Projects," which appeared in the *Bulletin of the Pan American Health Organization* 15(3): 208-215, 1981.

It should also be recognized that there is simply not enough "free" money to pay for meeting greatly expanded goals. Therefore, the strategy finally arrived at should take account of this state of affairs. Among other things, it seems evident that every community served, from city to hamlet, must recover at least the full cost of system operation and maintenance from the sale of water and sanitary services.

In addition, there has been a pronounced tendency for "Decade" plans to overlook investments needed for major repairs and replacements. Well-run municipal organizations can often provide financing for some major items that wear out; but rather than rely on this "hit or miss" approach, it is important that plans for the Decade reflect key repair and replacement needs.

Overall, funds will probably be in short supply in the 1980s, and so agencies wishing increased allocations will have to earn the increase by pursuing sound strategies that take account of past experiences. However, the UN's designation of the 1980s as the International Drinking Water Supply and Sanitation Decade may well provide part of the impetus needed to get greater government commitments in this field. Consequently, those in a position to promote better water supply and sanitation should seek to take advantage of the opportunity this act affords.

Guidelines for Drinking Water Quality

The advances made, particularly during the past decade, in knowledge of the effects of inorganic contaminants in drinking water on the health of people have resulted in the Organization taking a more positive view in regard to the quantities of such material that may be considered acceptable in drinking water. The *Guidelines for Drinking Water Quality* represent a revised combination of the *WHO European* (1970) and *International Standards for Drinking Water* (1971), which were in existence for 10 years. The *Guidelines* recognize that not in every country will it be possible to provide potable water that complies with the limit recommendations for every constituent set forth.

The primary aim of the *Guidelines* is to contribute to the protection of public health as defined by the Organization: "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity." This implies the elimination, or reduction to a minimum, of those inorganic substances in water known to be hazardous to the health and well-being of the community.

Several groups were set up by the Organization to consider the health

effects of dozens of the inorganic constituents occurring in drinking water and to make recommendations regarding action levels of those substances for inclusion in the *Guidelines*. Specifically, the task consisted of specifying and classifying those substances requiring limit values, setting limits for such substances, providing brief justification for the values chosen, giving systematic criteria documents detailing the health information employed, and providing detailed information on the application of the guidelines pertinent to each individual constituent.

The information mentioned above is essential to ensure that the action levels recommended are properly applied, permitting countries to establish national drinking water standards appropriate to their own circumstances. It is the intention that, in the light of specific situations and conditions, a degree of flexibility of implementation is permissible in interpreting the recommendations of the *Guidelines*. The published *Guidelines* are to be released in English in 1982. PAHO, in support of the program and as a means of furthering the exchange of technical information among the countries, will soon thereafter be issuing the document in Spanish. It will also be offering regional workshops—the first of which is to be held in the fall of 1982—to promote wider understanding and utilization of the *Guidelines*.

Fluoridation

In cooperation with *Mexico*, PAHO staff gave a short course to officials of the Yucatán Drinking Water Board (Junta de Agua Potable de Yucatán) in which 30 of the agency's professionals, local university staff, and representatives from other institutions took part. The Board was fluoridating three water systems, including Mérida, and planned to extend the program to all systems under its authority. The agency accepted PAHO's recommendations and is using simplified equipment called saturation-suspension cones, which were initially developed in Brazil. Cooperation was also offered to the Subsecretariat for Improvement of the Environment of the Health and Welfare Secretariat.

Assistance was offered to the Ministry of Health and the Sanitary Works Directorate of *Chile* in preparation of the licensing rights to the purchase of dosifying equipment to restart and expand the fluoridation program at the national level—for which purpose the government set aside US\$1.5 million.

PAHO staff offered collaboration to the Ministry of Health of *Ecuador* in the training of personnel of the Andean Area Institute of Dental

Resources (Instituto de Recursos Odontológicos del Area Andina—IROA) in the use of the Orion 409 equipment for the analysis of fluoride—equipment which was made available as a loan for the realization of the national inventory on the natural content of fluorides in public drinking water in the country. A demonstration was carried out analyzing almost 40 water samples from supply systems in Pichincha Province. In addition, a course was given to staff of the Ecuadorean Institute of Sanitary Works (IEOS).

Contact was made with staff of the Ministry of Health of *Peru* and of the Callao Salinera because national authorities are interested in putting into practice table salt fluoridation in those communities and areas of the country where this measure would be practicable.

Advisory staff in fluoridation participated in the *Area IV* (Colombia, Ecuador, Bolivia, and Peru) meeting of PAHO engineers and staff of water agencies in the respective countries covering the subjects of fluoridation and disinfection.

Operation and Maintenance of Water Systems

The importance of the operation and maintenance phases of water supply and sanitation projects cannot be understated. Improper operation of water supply systems may compromise the benefits they provide or even introduce risks. Lack of fuels and lubricants leading to failure of mechanically powered pumps will force consumers to return to traditional sources. Failure to close taps after use or to dispose of waste as planned may increase operating costs, exhaust supply sources, or create hazards from stagnant waters. Failure to protect the area around a well from domestic animals may create additional health hazards, by seepage of surface contamination into the water source.

Problems of maintenance and repair afflict both supply sources and distribution of water. The scarcity of qualified technicians and the ubiquitous problems of procuring spare parts argue against complex or sophisticated equipment. On the other hand, simple technologies such as hand-pumps are often more liable to breakdown and are readily vandalized. A system consisting of many independent, discrete parts—latrines, hand-pumps, etc.—is inherently more stable than a single large centralized system, especially where maintenance capacity is low. In the former, a failure results in a few people out of service; in the latter, an entire community is affected. The choice of a technology should reflect its maintenance requirements, the ease with which maintenance can be accomplished, and the impact on health and the environment of a possible failure.

Even water systems that function well will not have their potential impact on health if not accompanied by good water handling practices and improved hygiene. Contamination of water may occur anywhere between the distribution point and consumption. Soiled collection or storage jars and dippers are common vehicles for contamination.

Waste disposal systems present even greater potential for problems. Because most societies have ritualized disposal practices and have erected taboos around defecation, changing behaviors is difficult. Convincing consumers that the benefits of improved waste disposal are indeed benefits may be particularly hard when the solution being advocated is

confined, malodorous, or shared. Keeping community sanitation facilities clean is generally difficult, and failure to maintain water seals or vents or to relocate privies as pits are filled may discourage use or render a facility unsafe. Selecting a technology that is consonant with traditional practices, and limiting the numbers of people sharing a facility, will minimize these problems.

Operations and maintenance of water supply systems is a major component of the PAHO environmental health program. The project for technological development of drinking water supply and sewerage institutions (DTIAPA), which was initiated with an agreement between the Government of Peru and the IDB in 1978, continued on the basis of a new agreement signed in May 1981 to extend the project until year-end 1983.

Efficiency in the delivery of drinking water supply and sewerage services basically depends on technological, institutional, and socioeconomic factors—with DTIAPA stressing the technological. But many of the deficiencies in operation of the corresponding systems are due to the lack of human resources and poor institutional development; therefore, these elements should be considered essential to technology in water. Consequently, in the programming of DTIAPA, institutional and human resource development subjects are being introduced along with technological ones. Project activities thus cover four basic fields: training, technical cooperation, information, and research.

Training has been stepped up throughout 1981-1982 in the form of numerous courses held at CEPIS and some of the related national institutions for hundreds of participants from some 20 countries in the Region. Subjects covered include: water metering and consumption control, leakage control, rural water supply program evaluation, institutional development for rural system operation and maintenance, general information on ground water, well design and construction, etc. Additionally, a workshop on evaluation of drinking water and sewerage agencies was held with the support of Peru, CEPIS, and the World Bank.

Research carried out as part of the project included: a study of the prevailing situation regarding water supply to the rural population in Peru, a study on the system and organization required to optimize the functioning of motors and pumps used in the rural aqueducts of Peru, slow sand filtration in rural aqueducts, the establishment of a permanent training system for the Peruvian water and sanitation subsector, methodology for meter evaluation, a study to determine the most convenient approach for the establishment and operation in Peru of a drinking water and sanitation information network linked to REPIDISCA, and evaluation of the opera-

tion and maintenance of stabilization ponds for wastewater—including the implications for human health of effluent reuse.

Information activities related to DTIAPA include continued publication of the newsletter *Carta Periódica*, printing of the proceedings of courses and workshops, and response to requests for DTIAPA project publications.

Direct technical cooperation through the project involved analysis of the viability of a project on water supply to the population of Lima following a major earthquake and technical advice in regard to domestic water meters.

In Colombia two workshops took place on the evaluation of rural aqueduct systems for section chiefs of the National Institute of Health. As a result, more than 500 rural aqueducts have been evaluated, and 450 more are in the process of being reviewed. CEPIS will process the information collected so that corrective measures can be taken and manuals on the operation and maintenance of these systems prepared.

In Colombia, INSFOPAL has been experimenting with a new process for production of chlorine using table salt, given the growing scarcity in the country of chlorine gas for treatment plants. This simplified chlorine production system has been applied for several weeks at a plant in Subachote; if the results prove positive, it will be utilized in other small cities supplied by INSFOPAL systems.

Institutional Development

The planning, construction, operation, and management of environmental health services depend on a sound sector infrastructure. Thus, a principal strategy of the PAHO environmental health program has been the development of institutions, in recognition of the problems faced by the sector in most of the countries of the Americas. Whereas the construction of water supply and sewerage systems has stepped up since the early 1960s, the agencies responsible for operating and maintaining those systems have not always been prepared to obtain their maximum benefit. In the environmental health sector, moreover, the development of its institutional structure, the agencies themselves, and of their managerial skills has not kept pace with the growing demand for services and programs.

Consequently, the Organization's technical cooperation in the area focuses on improving the sector's institutional and legal structures; strengthening the agencies through institutional development projects and programs—including organizational and management information systems for better operations and decision-making; preparing guidelines and models, developing managerial skills through training programs; and designing local rural institutional schemes for the management, operation, and maintenance of water and sanitation services with community participation within the comprehensive primary care approach.

In the recent past, PAHO has collaborated with the countries in developing national institutions responsible for providing water supply and sanitation services in rural, urban, and periurban areas. Funding has been provided by the IDB, World Bank, UNDP, and bilateral agencies as well as by various national institutions. PAHO consultants provided management advisory services—including training—in the planning, operational, financial, and administrative fields.

In accordance with mandates of the PAHO Governing Bodies, environmental health and other PAHO staff are currently developing a regional evaluation and monitoring system in order to gauge progress toward achievement of the goals of both water and health for all and to cooperate with the countries in the implementation of national evaluation and monitoring processes. The regional system, which is being coordinated with the global system developed by WHO/Geneva, should serve as a

catalyst to strengthen managerial efforts for national health and environmental health development and should help refine the policies, strategies, and plans of action of the Organization. To implement the system PAHO is planning to sponsor a series of subregional workshops for national and PAHO staff in the second half of 1982.

In 1981 and 1982, in support of the formulation and execution of national drinking water and sanitation plans, the Organization collaborated with Bolivia, Haiti, Honduras, and Paraguay in the preparation of their institutional development programs as a continuation of cooperative activities carried out with the German Technical Cooperation Agency (GTZ).

PAHO environmental health staff, in collaboration with the Economic Development Institute (EDI) of the World Bank, are developing a module on institutional analysis, which will be included in the regular courses and seminars on water supply and sanitation project planning. A pilot experience of the application of training material developed by EDI for these seminars, with the use of case studies and audiovisuals, took place in Bogotá, Colombia in May 1982, with 29 participants from eight countries, under the sponsorship of EDI/World Bank, PAHO, and the Colombian National Institute for Municipal Development (INSFOPAL), the University of the Andes and the National University of Colombia. Once this material is prepared in final form, it will be available for the use of participating agencies, in order to program and execute such training activities.

In addition, CEPIS conducts two regional programs related to institutional development. The first of these programs is for *strengthening of commercial systems of water supply and sewerage institutions*. It aims to identify, generate, and promote approaches and means to assist water and sewerage agencies in the achievement of financial self-sufficiency, so as to make possible a greater financial viability for the programs of the Decade and, based on agency need for this fundamental component, to plan the development of their human and institutional resources.

The design and preparation of modular teaching/learning cycles, discussion of their form and content with a group of experts, and identification and establishment of agreements with possible cooperating agencies with whom pilot training activities could be developed, allowed the achievement of a clear program definition in this sector. Four Brazilian agencies, each with extensive experience in its respective area, would collaborate in the program in regard to micrometering; commercialization, consumer records, billing and collection. The agreement between PAHO and the Brazilian National Housing Bank (BNH) also provides for major support for the training program in this sector. Two

educational events took place in the summer of 1981: a workshop on development of commercialization subsystems in water and sewerage agencies, with 22 participants from six countries, and a workshop on development of consumer records, with 24 participants from seven countries. Preparation of the training material on evaluation of water meters, including aspects covered in the workshop on the subject, is ongoing.

With respect to research and development of technology in the program, possible additional study themes were evaluated (such as the economic and financial aspects of the use of meters, adequate tariff policies for the financial viability of the agencies, improved record practices, the billing and collection subsystem, etc). Meetings were also held with authorities in Lima to agree upon action which would permit the intensification of studies on appropriate methodology for the evaluation of domestic meters, and specifications were prepared for the equipment necessary for the strength or useful life tests of the meters. Likewise, the data processing system for the billing system, cadastre, and collection used by SANESUL (Campo Grande, Brazil), developed with the collaboration of SATECIA (as the result of a BNH/PAHO agreement), was analyzed to study its possible application in other countries of the Region.

Worthy of mention in the area of activities related to this regional program in dissemination of technical information are the preparation and distribution of reprints of the principal lectures given during the two workshops mentioned; the preparation of the Memoria of the Workshop on Development of Commercial Systems; response to requests for information received on topics related to this program, in coordination with the services of REPIDISCA, and progress in the preparation of a preliminary version of the manual on meter evaluation. On this same subject, and at the request of the ESAL General Management, technical cooperation was given in the area of measurement of consumption and the aspects to be treated in the respective workshop.

The *regional program for technical and institutional development of the agencies responsible for basic sanitation of nucleated and dispersed rural population* focused on human resource development activities, including work on a manual on rural aqueduct operation and management, preparation of a course for operators of rural aqueducts, and scheduling of a seminar on appropriate technology for water lifting in rural areas. A report progressed on the study for optimization of the operation of motors and pumps in rural aqueducts, and a model was to be developed to strengthen the operation of those aqueducts. Work continued on the identification of appropriate technologies for drinking water supply in rural areas.

PAHO cooperative efforts with the countries are highlighted below:

Brazil. A project has been initiated that aims to assess the capability of the operating portfolio of the financial system of the National Housing Bank (BNH) for sanitation (COSAN). Cooperation will focus on analyzing the institutional situation as regards information, evaluation, and supervision of the financial system that supports the National Sanitation Plan (PLANASA) so that these aspects can be upgraded to meet growing demands on the Housing Bank resulting from World Bank loans to water and sanitation agencies. This project was signed by national and PAHO authorities in December 1981 and started in mid-1982.

Activities are underway for the development of a technical cooperation program for the implementation of the directing plan for the institutional development of Ceará State's Water Supply and Sewerage Company (CAGECE). Specific objectives include technical assistance for the execution of Ceará's Sanitation Plan in coordination with the National Sanitation Plan (PLANASA) and to related environmental health agencies for the purpose of establishing a permanent balance between demand and supply of water and sanitation services in order to extend during the Decade potable water services to a minimum of 90 per cent and sanitation to at least 65 per cent of the urban population. This project will continue implementation of the techniques devised as part of a technical cooperation program (SATECIA) executed by BNH and PAHO.

The technical cooperation project for implementation of PRODISAN continued involving the development of three basic modules: (1) an operationalization module aimed at implementing an institutional development master plan at the national level and in each company, including the organizational and operational tools necessary for the functioning of a line of credit and financing of institutional development activities; (2) an execution, control and evaluation module, and (3) a strengthening module aimed at establishing the conditions that guarantee the maintenance and pursuit of a program set up by the National Housing Bank for state sanitation agencies (PRODISAN). Implementation of the modules is ongoing on the basis of several strategies: establishment of a national institutional development system, including the required policies and activities for human resource development and technical assistance, application of critical standards for institutional development of the agencies, development of pilot projects to elaborate and institute those standards, promotion of support by the national advisory groups in the institution of those norms, and development of commercial system modular

training material with CLATES assistance. The final result will be adapted for use in other countries of the Region through the CEPIS program on strengthening of commercial systems of water supply and sewerage institutions. The extension of this project under which seven modules will be developed is being processed.

Costa Rica. A project is in full swing whose objective is the development of an information system for AyA to realize control at the managerial and strategic level, in accordance with the definition of systems and subsystems of the institutional development program. This project will contribute to implementation of the evaluation and monitoring system for the water supply and sewerage sector of Costa Rica.

Dominican Republic. A project is in preparation with the National Drinking Water and Sewerage Institute (INAPA) to assist in the identification of required technical cooperation activities in the execution of its institutional development program.

Ecuador. Preparation began on a project with the Ecuadorean Institute for Sanitary Works (IEOS) which, along with the agencies for water and sewage, municipalities, and other provincial and district agencies are responsible for the delivery of environmental health services to urban and rural inhabitants in the country. The purpose of the project is to strengthen the environmental health sector in general, IEOS, and other agencies involved in the pursuit of sector objectives.

Within the cooperative program with IDB, PAHO prepared a project for the institutional development of the Municipal Sewerage Agency of Guayaquil (EMAG). This project is expected to start in the fourth quarter of 1982.

Guatemala. A project was completed in 1981 which aimed to assist the Executive Unit for Rural Aqueducts (UNEPAR) in the development and strengthening of its technical, operational, and administrative capability in order to efficiently carry out the construction of rural aqueducts as well as the administration and maintenance of those systems once built. Activities carried out as part of the project included cooperation in implementing the organizational structure of the program's executive unit, promoting community participation and increasing its share of responsibilities in the operation and maintenance of community water systems, and developing information systems to assist in decision-making.

Haiti. PAHO technical cooperation continued with the National Drinking Water Service (SNEP). The focus of the project is on implementing administrative, operation and maintenance systems, and on developing water sources. The completion of bidding procedures that would allow for

initiation of works brought provision of water supplies to the country's 10 medium-size cities much closer to realization. A second component of the project consists of a request for new activities, including the promotion of consultants in the areas of operation and maintenance of six new water systems; planning of the second phase of water coverage to the whole country; assistance to the control and supervision phases of work; and community participation.

Honduras. PAHO provided cooperation in the assessment of the national water supply and sanitation sector, as part of a preidentification mission of the World Bank within the PAHO/Bank Cooperative Program.

Mexico. A new program was formulated in collaboration with the Secretariat for Human Settlements and Public Works (SAHOP), the objectives of which are to train staff assigned to the program in applied systems methodology; to strengthen and develop the managerial and operational capacity of administrative agencies of the drinking water and sewerage services assigned to the project, through the formulation of organizational and management information system models; and to formulate the National Institutional Development Plan and create the necessary organization within SAHOP to carry it out.

Nicaragua. A project is ongoing which sets out collaboration with the National Institute for Water and Sanitation (INAA) for the execution of a program to develop the Institute's technical and operational capacity, particularly in the design and operation of drinking water treatment plants—using appropriate technology—and in the revision and updating of the systems, procedures, and manuals currently used by INAA for the operation and maintenance of water and sanitation systems.

Paraguay. A project has been initiated whose purpose is to give technical cooperation to the National Environmental Health Service (SENASA) for developing and strengthening its technical, operational, and managerial capabilities as well as to collaborate with SENASA in the execution of a World Bank-funded project for rural water supply and sanitation. This is a continuation of previous technical cooperation to SENASA, which started in 1977.

Uruguay. A project is well underway to provide the national sanitation works agency (OSE) with an up-to-date technical record system which will allow for the ongoing provision of information on the operation and maintenance of system components in the distribution network of the Montevideo Drinking Water System; determination and categorization of different causes that are influencing the unaccounted-for water losses (around 40 per cent) through the obtaining, processing, and analyzing of

operational data related to water flow, volume, pressure, and levels throughout the Montevideo System; and analysis and improvement of the commercial system of OSE including metering, consumer records and billing and collection. Additionally the objective of financial management has been obtained already with the implementation of a computerized accounting system and related activities.

Venezuela. A project is being proposed for the development of the human resources necessary to strengthen the National Sanitary Works Institute (INOS), as it is estimated that the progress to date in providing drinking water and sanitation to the country's population will have to be stepped up in order to meet the goals of the Decade. The project itself entails the structuring of an action plan, in the preparation of which the country has solicited PAHO cooperation. During 1981 and 1982, PAHO and INOS collaborated in an analysis of the current institutional situation based on a systemic approach, defining and classifying the various component systems that interact to meet the global objectives of the institution; the commercial, operational, administrative support, financial, and planning systems as well as the managerial functions and management information systems. In addition, an occupational matrix was drawn up to assist in executing the plan.

Appropriate Technology

To minimize the very substantial investments needed for the Decade, appropriate technologies are needed. An appropriate technology is defined as a method or technique which provides a socially and environmentally acceptable level of service or quality of product at the least economic cost. To select it, one begins by identifying all of the technological alternatives available for providing the good or service desired. Usually some technologies can be readily excluded for technical or social reasons. For example, some technologies may require institutional support that is not available given the social environment. For feasible technologies, cost estimates are prepared, and least-cost solutions for each technology are selected. On the basis of these economic costs and discussions with government planners, financial costs are prepared for all least-cost solutions. The final say should be with the beneficiaries—i.e., the community. Those alternatives which have survived technical, social, and economic tests are presented, along with their costs, to the community, and the users decide what service level they are willing to pay for.

Rising energy costs have affected virtually everyone's life throughout the Americas. The effect has been especially detrimental for the rural poor and residents of small villages. The costs of conventional forms of energy—electricity, petroleum, and coal—have risen proportionately more in rural areas because the cost is compounded by the fact that conventional energy must be “imported” into the vicinity from elsewhere. For this reason, engineers are now investigating and, when feasible, utilizing local sources of energy which previously did not seem worthy of attention. This multiple-option approach to energy utilization should be made a cornerstone of Decade activities.

Two forms of energy that are sometimes available locally are the kinetic energy of flowing water and the potential energy in naturally elevated bodies of water. Historically this energy has been tapped by water wheels and turbines. During the early 1900s, kinetic energy was used to pump water through use of a popular device called a hydraulic ram. Direct use of hydropower to drive machinery fell into disfavor with the discovery and use of low-cost fossil fuels. But today the cost of fossil fuels is no longer low, and it is rising at an ever-increasing rate.

Many of the old devices to capture water power are now being “rediscovered.” New materials and a better understanding of scientific principles have led to significant improvements. In addition, several new devices have been developed. Many of these are simple, reliable, low-cost, low-maintenance, low-overhead, and low-output devices that could be built from readily available materials and operated by relatively unskilled operators in small remote villages. These characteristics make them ideal for use in small villages, schools, and health posts.

Water supply professionals should be made aware of the range of solutions that are available to power water pumps, so that they can better match local resources to technical solutions. The resulting appropriate solution would reduce the number of situations where the community water system fails because local operators can not maintain, obtain spare parts for, or afford the conventional energy source—e.g. electricity, gasoline, diesel motor—used to drive the pump.

While hydraulic rams, barrel pumps, and other such devices are not cure-alls, they can expand the number of alternatives available to those seeking to provide safe water in adequate quantities by 1990.

PAHO Activities in the Region

In the area of appropriate technology for water supply and sanitation, the Organization began a number of diverse activities during 1981 and 1982. Environmental health staff constructed a working model of a hydro-pneumatic pump that utilizes the energy of falling water to pump water to a higher elevation. Of a related nature, arrangements were made for additional testing, development, and production of design curves by the Water and Sanitation for Health (WASH) project funded by USAID.

PAHO provided the National Drinking Water and Sewerage Service (SENAPA) of Peru technical information on solar distillation and the use of photovoltaics for the provision of water to remote areas. Other information was supplied on appropriate technology for use in the periurban slums of Lima, for which a demonstration project proposal was initiated (see page 39).

Co-composting of refuse and latrine waste was the subject of discussions held with the World Bank and UNDP, and it was arranged for a PAHO consultant to assist in setting up pathogen-monitoring procedures.

Staff prepared a draft of a pamphlet on handpumps—their uses and the factors necessary to make their installation in a community a success. The

draft will be translated into Spanish by CEPIS and tested in the field, revised on the basis of comments received, and then distributed.

Two CEPIS regional programs relate directly to the development of appropriate technology. The first, *appropriate technology for collection, treatment, and final disposal of wastewater and excreta, for medium and small communities and dispersed rural populations* has as one of its principal objectives reduction of the risk of illness resulting from the use of wastewater for irrigation, a fairly widespread practice in the Region. At the same time the program attempts to identify, analyze, and develop appropriate low-cost technologies for the treatment and reuse of wastewater, especially through stabilization ponds, and based upon the experience gained in the design and experimental operation of the existing ponds at San Juan de Miraflores (Lima, Peru). The Peruvian Ministry of Health, the DTIAPA project, and IDRC of Canada are collaborating in a second phase of the ponds project. In addition to this component, the program also includes non-conventional sewerage systems and a rural systems program of studies on biogas and alternatives to the flush toilet.

During 1981-1982, much of the preparatory phase of the work has been completed, along with adaptation and cleaning of the set of ponds, with the collaboration of SERPAR, the first set being put into operation and the parasite and salmonella count test in the pond effluent beginning. All the microbiological analysis techniques have been reviewed, leading to the introduction of important simplifications, and staff visited Lima slum areas to identify a possible site for a demonstration project for a nonconventional excreta disposal system.

In the development of human resources, a technical seminar was given on the results of the first phase of the project. CEPIS is conducting a residence program for in-service training of professionals in laboratory and field techniques for the evaluation of stabilization ponds. Other in-service training focused on bacteriological and chemical water analysis techniques. A presentation was made of a seminar on appropriate technology for sanitation systems in marginal urban areas, rural areas, and refugee camps. Courses were given on marine pollution, with lectures on marine outfalls and municipal discharge in coastal areas, and on small wastewater treatment systems. The Wetlands Research Center of the University of Florida offered assistance in the form of a technical seminar and film on the use of swamps for the treatment and disposal of wastewater. In November 1981 CEPIS personnel offered a course on wastewater stabilization ponds to 25 participants from Argentina, Bolivia, Colombia,

Ecuador, Peru, and Venezuela, with the collaboration of professors from REPIDISCA cooperating centers—one from CIDIAT in Venezuela, two from CETESB, São Paulo, Brazil, and one from the National University of San Marcos, Lima, Peru.

Preparation of proposals for research and technology development relating to this program included a possible study component on groundwater in the San Juan Ponds project, an evaluation of community latrines and biogas units and their use in rural and urban slum areas, toxicological aspects of the reuse in agriculture of treated wastewater, and the construction and evaluation of low-cost rural water treatment plants, to be carried out in four or five countries of the Region. Additionally, a study is being prepared on the cost of wastewater treatment by stabilization ponds.

In the technical information aspect of the program, staff made a bibliographic review of the health aspects of wastewater reuse; completed and published a CEPIS technical document on progress in the treatment of wastewater using stabilization ponds (in Spanish); review of the manual on simplified methods for chemical analysis of wastewater (in Spanish); and put the final touches on the manual on experimental procedures for the evaluation of stabilization ponds (in Spanish). The manual on design and operation of stabilization ponds is in preparation. A report was prepared on the design of oxidation trenches for a cooperative mission to the government of Suriname, cooperation was offered to USAID in the formulation of a document for a large-scale agricultural irrigation program on the desert coast of Peru using wastewater from Lima, and in cooperation with the Peruvian Ministry of Health terms of reference were prepared for feasibility studies in the areas of environmental health relating to the reuse of water.

With respect to direct technical cooperation in this program, CEPIS collaborated with Suriname (Public Works Ministry) on the operation of the Half Flora Sewage Treatment Plant, and on the planning and operation of wastewater disposal systems in the country; with Bolivia through missions to Cochabamba and La Paz; and with Peru in scheduling for initial start-up of the wastewater treatment plant in Cusco.

The CEPIS regional program for *technical and institutional development of the agencies responsible for basic sanitation of nucleated and dispersed rural population* aims to extend the provision of water and basic sanitation to underserved rural populations and urban slum populations, which will undoubtedly require a corollary effort in the integrated development of the institutions responsible for this service. This program therefore proposes to promote

intensive use of low-cost appropriate technology for rural sanitation, while attempting to achieve greater community participation in its development.

The human resource development aspect of the program consisted of a number of courses and workshops: on evaluation of rural water supply programs, on institutional development necessary for the operation and maintenance of rural aqueducts, on supply of water to dispersed rural populations, and on supply of water to urban slum areas.

With respect to research and technology development, a regional seminar was proposed on local windmill technology, as was a project on the evaluation of technological and sociocultural aspects affecting the slow-sand filtration process. The principal regional UNESCO projects were analyzed with emphasis on appropriate technology for supply of water and sanitation services to nucleated and dispersed rural populations in arid and semiarid zones. A plan of action was prepared establishing an informal network of pilot and demonstration projects, among which several PAHO/CEPIS projects are included.

Staff discussed a preliminary proposal for a DTIAPA project study on development of a model for institutional strengthening of rural potable water services in Peru; officials of the Ministry of Health will review the document prepared by CEPIS and put together the final proposal. DTIAPA is also working on a feasibility study for rural water supply systems. A questionnaire has been designed for the corresponding data survey. Appropriate technology for water raising in rural areas was the subject of a seminar held in June 1982, and the DTIAPA project considered the possibility of a demonstration project for the training of rural system operators in a subregion of Peru.

Other activities included an investigation to define a methodology for an evaluation of the sociocultural, economic, and technical impact of water systems in rural communities; a study on optimization of motor and pump operation in rural aqueducts in Peru—carried out as part of the DTIAPA project in cooperation with the Ministry of Health; and a study on the efficiency and costs of simple procedures for sand washing in slow filters in rural areas, in collaboration with the Sanitary Engineering Office of the same Ministry.

Staff reviewed financial models for possible application in water and sanitation programs as well as other models of financial analysis applicable to drinking water projects. Further research targeted case studies for the analysis of municipal water supply projects.

Solid Waste Management

The management of solid wastes, despite the concern of health and other authorities, continues to be a growing problem. Large metropolitan areas are particularly susceptible to crises in solid waste collection. Like other considerations, the health, environmental, and socioeconomic aspects of the problem are interrelated. Countries are developing a greater understanding of the problem and are initiating solid waste management plans or preparing them for national or international financing. Efforts focus on improvement and expansion of disposal services, giving special attention to the marginal population in larger cities and metropolitan areas. Attention also centers on the disposing of toxic, mining, industrial and special solid wastes such as sewage sludge and radioactive wastes.

In the Americas problems stemming from solid wastes are liable to become even more acute with the imminent industrialization and population explosion projected for the hemisphere. These problems, in turn, translate into greater threats to human health and the environment.

Most municipal sanitation services in the hemisphere were organized decades ago when the populations they served were considerably smaller than the urban explosion has made them today. Whereas in 1960 some 20 cities in Latin America and the Caribbean had populations of more than one-half million, there are 50 such cities now.

Related to stepped-up development is the production of hazardous and toxic wastes: these products, resulting from industrialization and the technification of agriculture, are released into the environment, come into contact with man, and can injure his health. Such wastes are often impossible to breakdown and recycle naturally. Thousands of chemicals are presently in use and hundreds of new ones are marketed yearly—yet only some 200 of these are subject to health risk standards.

The PAHO Regional Program

The major purpose of the Organization's program of technical cooperation in the area of solid waste management targets the creation of adequate urban solid waste management systems, especially in metropolitan

Plan of Action

SOLID WASTE MANAGEMENT

Approaches

The Plan of Action is directed to improve and expand solid waste disposal services giving special attention to the marginal population in larger cities and metropolitan areas. Emphasis will be on developing national policies, plans, programs, and projects; strengthening of solid waste management in the urban areas; improvement of the sanitary disposal of wastes in the rural communities, and disposal of toxic, mining, industrial, and special solid wastes such as sewage sludge and radioactive wastes.

Areas of Action

1. Formulation of policy and guidelines for solid waste management, including recycling and reduction of refuse generated.
2. Promotion of project identification in metropolitan areas and cities and preparation of proposals for their financing and implementation.
3. Participation of the community in solid waste management programs.
 - Promotion of intersectoral coordination and inclusion of urban solid waste disposal and cleanliness of the home in elementary education.
 - Development of mechanisms and instruments for community participation.
4. Development of human resources.
 - Encouragement of the training of personnel at all levels for the management and operation of solid waste disposal systems.

Suggestions for Indicators

- Proportion of the population served by different types of service.

areas and large cities whose traditional collection and disposal services are seriously affected in the face of incessant increases in the generation of solid wastes, as a result of rapid urbanization and the ever-greater contribution produced domestically. In fact, in the last four years garbage and littering problems in large cities have taken up more space on the front page of newspapers throughout the continent than any other environmental health issue.

Thus, PAHO cooperative activities—those pursued in Headquarters, CEPIS, and the countries—are directed to carrying out national and subregional programs; identifying projects; preparing and disseminating guidelines on different aspects of planning, administration, and operation; and training of the human resources linked to sanitation services.

Another program objective is the formulation of basic proposals for special solid waste control in countries where such wastes represent a problem. Within the category of “special” are included industrial, mining, and agro-industrial wastes as well as radioactive, toxic, and highly dangerous wastes. In regard to the last-mentioned wastes, it is important to mention that they not only refer to those generated in the countries of the Americas but to those reaching the Region from abroad by various means.

This urban sanitation focus of the program is due to the fact that the risk to public health from inadequate management of solid wastes is increasingly greater in the cities. Contributors to this condition are the overwhelming trend towards urbanization, the constant increase in the production of waste per inhabitant per day, inadequate collection services, poor administration of those services—including labor conflicts that often result in strikes, and the chronically poor financing of urban sanitation companies. Collection services available in cities today only pick up two-thirds of generated urban waste, and no more than a dozen of the major cities operate technically sanitary landfills. Moreover, even though the past decade has been characterized by the drive to put into practice the technical engineering and operational aspects of sanitation services, little progress has been made in modifying and strengthening organizational systems for planning, administration (including staff management and community participation), commercialization, and financing of urban sanitation institutions. One should remember that one-third of a million people are directly linked with urban sanitation management, and that their relationship with public sanitation agencies has become a critical factor in the problem.

For the reasons outlined above the urban problem is far different from

the rural. In regard to the latter, PAHO stresses utilization of the primary health care strategy as a means of improving the sanitation situation of housing in rural areas and their environs, and the future plan of action of the program takes this strategy into account.

Recent activities of specific interest are the sectoral studies done in Chile that resulted in the execution of actual sanitary landfills in Santiago and other cities, the optimization of collection services in Santiago, the efficient utilization of contractual services, and the active working of the Technical Committee for Urban Sanitation that coordinates at a high level the various agencies involved.

Basic studies were prepared for the development of national urban sanitation plans in Cuba, which has 45 cities with more than 20,000 inhabitants, and Paraguay, with 24 cities with more than 4,000 inhabitants; and a national urban sanitation plan was initiated in Brazil.

Identification of projects and provision of technical advisory services were the subjects of cooperation in Guatemala to the Chimaltenango project, in Honduras to Tegucigalpa, in Panama to the Panama City project, in Cuba to the city of Santiago, in Bahamas on specific problems of solid waste treatment, in Colombia to Neiva, in Peru for review of the Cuzco and Chiclayo projects, and in Chile and Brazil on the generation of methane gas in sanitary landfills.

PAHO held two subregional workshops on solid wastes in 1981 in which PAHO country engineers also took part. The first was held at CEPIS for 36 participants from nine South American countries, and the second in Santo Domingo, Dominican Republic with 29 participants from Cuba, El Salvador, Haiti, Mexico, and the Dominican Republic.

Buenos Aires was the site in 1981 of the VI Latin American Urban Sanitation Course, with 20 participants from different countries. In addition, the following subregional workshops have been held on collection and final disposal of solid wastes in which CEPIS participated actively: in May in Neiva, Colombia with 25 participants from different countries; in August in San José, Costa Rica, with 21 participants, nine of which were from abroad.

The subjects of various materials prepared by Headquarters and CEPIS and disseminated in 1981 and 1982 through workshops and courses or by directly sending them to the countries included a module on final disposal, one on collection of solid wastes, one on cleaning of public thoroughfares and areas, features for the formulation of national solid waste plans, institutional aspects of urban sanitation services, and the translation of two other documents, with the authorization of the Ameri-

can Public Works Association, on analysis of equipment replacement and preventive maintenance, both of which are part of a manual on administration of equipment.

In the Meeting of Directors of Basic Sanitation Agencies and of PAHO engineers in the Andean subregion, held in Lima in November 1981, participants recommended that the Subregional Solid Waste Project for cities of more than 500,000 inhabitants be accepted and executed; as a result, it was to be presented by the Executive Secretary of the Hipólito Unánue Agreement at the next meeting of Ministers of Health of the Andean Pact.

CEPIS activities in this program have centered on the optimization of institutional development, work programs, procedures, equipment and other aspects related to the agencies and operations of modern and efficient urban sanitation, on the promotion of nonconventional solutions for garbage collection in slum areas using community participation, and the promotion of development of a simple technology for sanitary landfills in large urban areas.

The human resource development component of the program has resulted in preparation of a draft program for the development of modular learning cycles in the area of solid wastes, which proposes the inclusion of 20 modules and seven submodules. The first two modules, on final disposal and collection, have been prepared with the cooperation of Colombia (INSFOPAL) and Costa Rica (Environmental Health Office, Ministry of Health). Others include such subjects as common problems of sanitation services, macroindicators for management of sanitation services, economic and financial aspects, human resource development, transfer stations, and semi-mechanized materials recovery. The first version of the module on cleaning of streets and public areas was completed. The preparation of subsequent modules continues to progress, and several are expected to be ready by mid-1982.

Despite the importance of the problem, research and investigation on solid waste management in the countries is limited. Some research is being done on the recovery of waste heat and recycling of wastes at the Municipal Urban Sanitation Company (COMLURB) in Rio de Janeiro, Brazil, but much more work in this area is needed. CEPIS provided cooperation and information to the Sanitary Engineering Section of the University of Chile for a study on recovery of methane gas from a sanitary landfill and to the Metropolitan Council of the Central District of Tegucigalpa, Honduras, for a study on collection of solid wastes in marginal areas of the city; the latter study is being carried out with financial assistance from the IDRC of Canada. Studies have been undertaken

on economic aspects of solid waste collection and disposal systems and development of practical examples for analysis of effective costs according to the cost/benefit method.

Recent Activities in the Countries

Following are the highlights of some of the recent activities related to solid waste management carried out in the Region.

Argentina. A PAHO consultant reviewed and prepared for publication a manual on the practice of collection, treatment, and final disposal of solid wastes, selecting topics from the six annual Latin American courses on urban sanitation held at the Sanitary Engineering Institute of Buenos Aires University.

Barbados. Solid waste disposal is one of the programs of major emphasis in the country. The government is collecting information on the volume and type of solid waste material available to assist a feasibility study for resource recovery, for which PAHO provided advisory services.

Chile. A Technical Committee was set up to study and coordinate activities related to the treatment of solid wastes and urban sanitation, which proposes to implement recommendations of the solid waste sectoral study carried out in 1980, especially in relation to the project on sanitary landfills for localities of more than 20,000 inhabitants and the development of human resources for that type of service.

Colombia. The country initiated in 1981, with PAHO cooperation, a series of workshops to span the decade of the 1980's aimed at training professionals in techniques related to sanitary landfills. The first took place in Neiva, Huila and others are soon to be held in Pereira, Cartagena, Bucaramanga, and Pasto. The country also has launched a sanitation campaign using such promotional materials as posters and announcements in the newspaper, radio, and movie theaters.

Dominican Republic. PAHO gave support to the development of the meeting on solid waste for countries from Area II held in Santo Domingo.

Ecuador. Studies were furthered on solid wastes for several municipalities of the country, carried out by the Ecuadorean Sanitary Works Institute (IEOS). Special emphasis was given to the preparation of IEOS and municipal staff in solid waste management through courses organized by CEPIS and as part of the DTIAPA project. This activity should result in carrying out action that has been the subject of recommendations made in the past. PAHO not only gives cooperation to IEOS but also to water supply

and sanitation agencies, universities, and other institutions, mainly in the form of technical information and human resource development.

El Salvador. A workgroup has been set up to formulate the national solid waste plan and the sector plan of action for 1982-1983.

Guatemala. PAHO cooperated in the formulation of an urban sanitation project for Chimaltenango and Chiquimula, establishing a methodology for utilization in other cities.

Panama. Efforts continued to find a solution to the solid waste disposal problem in the Panama City metropolitan area. PAHO cooperated with IDAAN in the improvement and operation of the Department of Urban Sanitation of Panama and Colón.

Paraguay. PAHO staff cooperated in the preparation of a request to UNDP by SENASA in the area of solid wastes, related to the implementation of a National Solid Waste Plan.

Peru. PAHO collaborated in the execution of the National Urban Sanitation Plan; contracts were awarded for studies and projects in several of the larger cities (Cuzco, Chiclayo, Trujillo, and Ica) and the training of professional and technical personnel at the central, regional, and municipal levels; these and similar efforts will make possible the Plan's implementation and development and will result in a portfolio of projects that will permit negotiation of funding requests.

Occupational Health

The health problems of workers should be considered within the broad perspective of human ecology, not in the narrow context of specific work-related risks of accidents and occupational diseases. In countries where unemployment exceeds 20 per cent of the active population and where demographic pressures require the creation of jobs, workers' health problems should be posed in terms of the unemployment/employment dynamic. To obtain a salary which permits them at least the basic necessities—food, housing, clothing, education—workers will tend to accept any occupational risks.

Almost all the countries have institutions—often more than one—responsible for the protection of workers and the work environment. Still, not enough data are available in the countries of Latin America and the Caribbean to make an adequate determination of the seriousness of the occupational disease/accident problem.

While data on job-related health impacts are scarce, what information that does exist is enough to demonstrate that there are serious problems of job-related accidents and diseases that affect all countries, great and small, control of which should and does concern labor and health authorities. A conservative estimate is that there are at least 10 million job-related accidents in Latin America and the Caribbean each year—with more than 50,000 fatalities—and that the prevalence and incidence rates of occupational disease are similarly very high. Obviously, something must be done to protect the labor force, for both social and economic reasons.

Occupational Hazards of Agricultural Workers¹

The health problems of agricultural workers can result from their exposure to biological, physical, or chemical agents of disease. Biological hazards include zoonoses—animal diseases transmitted to man on han-

¹Source: Adapted from the "CAREC Surveillance Report," February 1982, which in turn reprinted the article "Hazards on the Land," by S.E. Asogwa, appearing in *World Health*, November 1981.

dling animals and animal products. The WHO Committee on Occupational Health has compiled a comprehensive list of these diseases, the most common ones being bovine tuberculosis, anthrax, and brucellosis. In addition, certain parasitic diseases—e.g., schistosomiasis, ancylostomiasis, and leptospirosis—are transmitted as a result of contact with polluted water on farm lands.

Chemicals are extensively used in agriculture to control insects, fungi, herbs, and rodents that damage crops. These pesticides and insecticides are harmful to man if not used carefully. Those at risk are mainly workers who are engaged in their manufacture, mixing, transport, and application (spraying).

Contamination of food from the use of empty containers has resulted in human poisoning, as has the accidental consumption of seeds treated with chemicals (mercurials) as preservatives. These chemicals tend to remain a long time in the environment and may affect birds, fish, and other forms of life. The most commonly used are chlorinated hydrocarbons (DDT is the principal member of this group), organophosphorus compounds (parathion and the less toxic malathion), carbamates, and organic mercury compounds.

Allergic diseases result from inhaling vegetable dust, pollen, and other organic dusts. Some of the conditions encountered include farmers' lung (following excessive inhalation of dust containing fungi), byssinosis from cotton (*Gossipium malvaceae*), flax (*Linum usitatissimum*) and soft hemp (*Cannabis sativa*), allergic conjunctivitis from rubber latex, upper respiratory tract disease due to allergy to wood dust, and dermatitis (also due to certain wood dusts).

As for physical hazards, the most common factors are heat (resulting in heat fatigue and other pathological manifestations including cramps and stroke), noise from machinery, dust, fumes and accidents of all kinds. Cuts from machetes and hoes constantly occur among those engaged in subsistence farming. Snake bites and poisonous insect stings occur from time to time, especially where farmers go barefoot. On large farms, the main causes of accidents include falling off and overturning tractors, felling trees, and falling from farm buildings.

A healthy worker is a productive worker, so providing occupational health for those engaged in agriculture is a worthwhile investment. National programs for that purpose should embrace all activities of health promotion, prevention, treatment and rehabilitation, and can function through health centers, mobile clinics, or purpose-built occupational health services. Those who operate such centers should have instruction

in how to deal with the special needs of farm workers. Small organized farms can also make use of mobile clinics and health centers, but these farms need to provide their own first aid services. Commercial farms, whether owned by individuals, the government, or agricultural groups, should provide a well-run occupational health service for their workers.

How can the better health of agricultural workers be ensured? They need to be advised on all hazardous factors to which they may be exposed and those individuals at great risk should be monitored. For example, people who use organic mercury pesticides for seed dressing should have a periodic check-up of their blood or urinary mercury estimation. Where laboratory investigations are not possible, clinical examinations should be done from time to time to detect early signs of toxicity.

Some occupational diseases can be prevented simply by explaining to workers the hazards of every operation they perform. Such instruction needs to be meaningful whether the worker is literate or not. There should be adequate supervision of the use of protective equipment and clothing.

Other measures that can be taken include all kinds of accident prevention, pre-employment, periodic and special medical examinations, provision of emergency services, training of first aid workers, maintenance of high standards of hygiene in canteens, toilets, and so on for the workers, and provision of facilities for families (schools, maternal and child health services, markets) to ensure good family life. Health education should aim at a high standard of sanitation and healthful living both at work and at home. Statistical data collected periodically should be analyzed and the information so obtained used to improve the health and welfare of workers and their families.

The Situation in the Caribbean. The most fundamental issue in this regard is one of awareness of present hazards for agriculture workers and the potential for the introduction of new hazards. At a time when much attention is being focused on primary health care, services for agriculture workers are often only the same as those offered to the general population.

Pesticides are the best example of hazards on the land for which there is insufficient awareness of risk. Caribbean examples abound, but the two reports that follow will suffice as illustrations of the problem.

A new nematocide was introduced by an association of banana growers who, in an effort to assist their members, purchased the pesticide in bulk for repackaging in smaller containers. Users were advised to sprinkle the pesticide around the base of the banana plants. The packages purchased by the individual grower were not labelled, and users were not aware that this chemical could be toxic by both ingestion and intradermal absorp-

tion. Fortunately, an early danger alert occurred when fish started dying in a river—deaths which were attributed to the disposal of the empty pesticide bags in the river and wash off from the cultivated lands on the river bank. On investigation, it was found that the manufacturer had excellent literature on safety precautions, but this information never reached the workers who were scattering the nematocide with their bare hands.

In the second case, farmers in another country were purchasing eight different pesticides from a cooperative. This veritable cocktail of toxicity contained pesticides that ranged from very high to very low toxicity. The cooperative did not offer for sale protective clothing nor did it provide advice on safeguards. The farmers did not wear protective clothing, stored the pesticides at home, sometimes near food items, and probably were not too careful about handwashing before eating their food in the fields. The result was hospitalization and deaths associated with the more toxic pesticides, which in turn served as a crisis alert for a complete review of the situation.

Among the lessons to be learnt from just these two examples are:

- There is an absolute need for joint consultations between agriculture and health authorities on pesticides in use or to be introduced.
- Points of distribution of pesticides should be checked to ensure that buyers are receiving adequately labelled packages and are made aware of the precautions to take.
- Cooperatives, government outlets, and possibly also the private sector (through duty-free concessions) should be encouraged to stock and sell suitable protective clothing in the same competitive spirit that the pesticides are sold.
- Primary health care services should be equipped to recognize and treat, at least initially, cases of poisoning from chemicals used in the area served by the facility. This implies retraining of staff and a much improved surveillance of agriculture worker occupational disease and injury. This awareness of hazards on the land should extend to the entire health service.

A significant start has been made in the Caribbean through the holding of agro-medical conferences facilitating the interchange of ideas and experience both from within and without the Caribbean. Some countries have introduced new legislation to control pesticides and provided health services for agriculture workers as part of government agricultural schemes. Zoonoses and the agricultural worker have been the subject of several studies, in particular on leptospirosis.

Prevalence of Chronic Lung Diseases Studied in Textile Workers

Many Latin American textile workers face the occupational risk of chronic bronchitis and byssinosis from cotton dust. Byssinosis is generally

a benign pulmonary disease caused by the inhalation of dust during certain stages in the elaboration of cotton, linen, and burlap threads and fabrics. The symptoms develop after years of exposure and can disappear when the worker is removed from the dust environment, even for periods of a few weeks. Initial irritations include precordial pressure, asphyxia, and cough, which with time can lead to clinical pulmonary insufficiency and emphysema. Chronic bronchitis is any muco-purulent secretion of the bronchial tree that is in evidence every day for three months a year for two years. Despite their prevalence, the extent of the problem of these two diseases has not been documented in the countries.

Chronic lung disease was the subject of a clinical and spirometric study made in Colombia of 87 workers in one enterprise. Carried out by M. Olaya de Ruiz, Y. Torres de Galvis, G. Molina M., and L.F. Ruiz G., the study found that the proportion of prevalence of abnormal spirometras rises in direct relation with the degree of exposure—proving convincingly the relationship dosis-response in terms of occupational risk. There is a significant relationship between years of exposure to cotton dust and frequency of chronic bronchitis and byssinosis that in the presence of industrial contaminants—especially carbon, cotton, and silicon dust—has frequently been associated with chronic bronchitis and other obstructive pulmonary diseases among exposed workers.

The researchers therefore recommended that the concentrations of cotton dust be controlled; that the workers use adequate respiratory masks to protect them from the cotton dust; that every worker be monitored by way of a questionnaire and a spirometry and that those who test positively for byssinosis be transferred to a worksite without cotton dust; and that entry physicals be used to avoid the employment of workers with asthma or chronic bronchitis in cotton dust sections.

PAHO Cooperation in the Region

The Organization continued to provide technical cooperation to the countries in their efforts to protect workers' health by reducing the rates of occupational diseases and accidents, particularly those related to chemical and other potentially toxic hazards. At the request of the Permanent Inter-American Social Security Committee, a document was prepared on occupational health in Latin America and the Caribbean, for presentation at the VI Inter-American Congress on Prevention of Professional Risks (Caracas, October 1981). In addition to providing an overall view of occupational health in the Region, the document describes the principal problems—work accidents, professional diseases (pneumoconiosis, deaf-

ness, and intoxications) and “special” problems (agricultural and small business risks and those to women and children). It also details strategies that the countries are utilizing to solve their occupational health problems, namely legislation, regulation and standardization; inspection of worksites; preliminary surveys on industrial hygiene; creation of specialized institutes, etc. The document views occupational health in terms of the goal of health for all by the year 2000. Finally, it recommends closer interinstitutional coordination, development of mechanisms to extend the coverage of programs, better program self-financing schemes, human resource development, and certain research activities.

Plan of Action

WORKERS' HEALTH

Approaches

The objective of this area of the Plan is to expand occupational health services, particularly in light of the expected characteristics of agricultural mechanization and industrial technology. The basic principles underlying this area are to foster the interest and active participation of workers and management in reducing disabilities from work-related accidents and diseases, including exposure to toxic substances; improve the knowledge of the cause of occupational disease; increase the monitoring of environmental factors at the work place and corrective measures to eliminate risks.

It is estimated that the coverage of risk prevention activities and medical surveillance reaches 30 per cent of the population through the social security systems in Latin America. Extension of services for workers in small industries and rural workers may best be achieved by incorporating occupational health in the regular community services. In addition, introduction of new products and technologies in the countries will require the health sector to participate actively in the strengthening of institutions, laboratories, and training facilities. Of major importance is the promotion of legislation to permit effective action for the prevention and control of occupational risks and intersectoral coordination to optimize scattered resources in various government agencies. An effective information system for evaluation of coverage and progress at the country and regional level is necessary.

Areas of Action

1. Development of policies promoting occupational health and safety.
 - Development of programs within industry, agriculture, and public sectors, including participation of the workers.
 - Establishment of a policy of cooperation at the national level among agencies responsible for occupational health.
 - Promotion of the development of pertinent legislation.
2. Improvement of the implementation of prevention, treatment, and rehabilitation programs.
 - Development of guidelines to permit evaluation and control of risks at work sites, including the protection of families of workers exposed to these hazards.
 - Incorporation of occupational health and safety in the training of health personnel.
 - Design and establishment of an information system.
 - Strengthening of laboratory services and field survey capability including toxicological services.
3. Strengthening of the capability of national institutions.
 - Promotion of programs of prevention and control of risks in industries and in agriculture, including small-scale enterprises.
 - Establishment of norms for institutional management of programs.
 - Development of training facilities and educational material.
 - Encouragement of the development of occupational health institutions.
4. Integration of occupational health in industrial and agricultural development projects.
 - Inclusion of occupational health in impact assessment of development projects.
 - Participation of occupational health personnel in the planning and preparation of projects.
5. Promotion of community participation.
 - Development of information materials on health and safety measures for workers and communities.
 - Development of comprehensive care of working women and their families.

Suggestions for Indicators

- Number of countries with programs to protect the health of workers.
 - Trends of morbidity and mortality in occupation-related diseases and accidents.
 - Man/hours lost due to occupational health-related problems.
 - Percentage of workers protected against occupational risks.
-

Research. No planning in regard to occupational health and safety is possible without adequate knowledge of the problems involved. It is essential to organize adequate statistical services, preferably under standards common to all the countries, in order to determine the real extent of the social and economic damages and the actual efficiency of the programs established. Data now available and any that may be obtained in the future should be published in keeping with common standards, so that comparisons can be readily made. Monitoring of work environments, calibration of direct reading equipment, use and control of pesticides as well as their impact on man and the environment are among the suggestions for research projects that have been put forward in recent years. Considerable applied research in the field of prevention of occupational hazards has been under way for many years at national laboratories in Argentina, Brazil, Chile, and Mexico, and under international auspices in Guatemala.

The Organization through its various mechanisms and some times in cooperation with other agencies, has consolidated and published much of the information available on research regarding occupational health. Guidelines on the general principles and methods, including the testing for and evaluation of food additives and pesticide residues—as well as on teratogenicity, mutagenicity, and carcinogenicity—have been published. International agreement has been reached for occupational exposure limits to lead, mercury, cadmium and manganese; others are under study. There are documents on early detection of health impairment due to occupational exposures, the standardization of methods for measurement, and evaluation of factors of the working environment. For its part, the International Agency for Research on Cancer has conducted many evaluations of the carcinogenic risk of chemicals.

Subregional Activities. At the request of the Ministers of Health of Central

America, a study was conducted during 1981 of the toxic effects of pesticides, aimed at the design of pertinent control measures. The coordination of a subregional program on occupational health was the subject of cooperation to the Andean Pact countries.

As the focal point for activities in this area, the Pan American Center for Human Ecology and Health cooperated with Brazil and Ecuador, and initiated cooperation with Argentina, in the preparation of research proposals as part of a proposed project on the exposure of women to risks in the working environment (see pages 117-120).

Courses, publications, and guidelines. ECO assisted in the preparation of a course for participants throughout the continent on risk prevention in the use of pesticides—held in Mexico, July 1982. Its purpose was to revise the Spanish version of material on the subject, prepared in English by WHO/Geneva, so that it can be distributed to the countries.

Other publication and course topics included occupational health itself, social service in industries, and a master level program on health and work. ECO proceeded with arrangements for translation of *Work is Dangerous to Your Health* by J. Stellman and S. Daum; of *Occupational Diseases: A Guide to Their Recognition*, a manual published by the United States National Institute of Occupational Safety and Health (NIOSH); and educational materials on asbestosis and occupational stress, issued by the Arizona Center for Occupational Safety and Health of the United States. Initial steps were likewise taken to publish a guide for the prevention of work risks in the sugar industry, to be done jointly with the Central American University Federation, and a guide on basic environmental sanitation in work areas, to be produced with the Colombian Ministry of Health and Social Security.

Activities in the Countries

A number of occupational health activities have been reported from the countries, of which some of the salient ones are described below:

Barbados. Due to increasing industrialization in the country, training was obtained for a senior public health engineering assistant in programs of occupational safety and health.

Bolivia. The national occupational health program is concentrating its efforts on the study of silicosis, the objectives of that project being: an epidemiological analysis of the prevalence of silicosis in the country on the basis of a representative sampling of the mining population; preparation

of an analysis of costs in terms of morbidity/mortality due to silicosis; and proposal of a silicosis prevention and control project in one of the mines of the Bolivian Mining Corporation, including the corresponding feasibility study. PAHO staff became part of the Technical Committee, the purpose of which is to provide overall orientation and plan general activities, which consisted also of representatives from the National Occupational Health Institute, the Social Security Institute, the Bolivian Mining Corporation, the Ministry of Labor, the National Preinvestment Institute, and the National Statistics Institute.

Brazil. Initial contacts were made with FUNDACENTRO regarding the preparation of technical guides on occupational hazards in different industries.

Chile. Training was offered to the national official in charge of occupational health for participation in the Latin American Workshop on Epidemiological Methods for the evaluation of the health effects of environmental pollution, held in Mexico in September 1981; as a result of that activity, arrangements were being made to hold in 1982 a National Seminar on Professional Illnesses for physicians and nurses in the health services.

Colombia. An epidemiological study was completed on an outbreak of amebiasis in a confectionary factory in Bogotá.

Mexico. PAHO staff worked with the National Autonomous University in relation to the program on social work in industry and with the Mexican Social Security Institute on a survey of lead levels in the blood of the nonexposed population, on publication of a series on prevention of work risks, and on modules on the same subject.

Paraguay. PAHO cooperated in the official presentation to UNDP of a request for collaboration in occupational health programs and the quality control of working environments.

Prevention and Control of Pollution and Other Environmental Health Hazards

Air, water, and soil pollution, and food contamination are becoming more prevalent in many parts of the world. Numerous governments have taken or are about to take measures to assess pollution levels and establish controls. The development of national programs for prevention and control of environmental hazards has however not kept pace with the increase in environmental health hazards brought about by rapid industrialization and urbanization, or by the introduction of new technology. The lack of basic policy, legislation, and an institutional framework constitutes a major obstacle to the implementation of national control programs in many countries. Consequently, the countries of the Americas have included control of physical and chemical pollution as a major component in the Regional Plan of Action (see inset).

Urbanization accompanied by industrialization represents one of the

Plan of Action

CONTROL OF PHYSICAL AND CHEMICAL POLLUTION

Approaches

The objective of this section of the Plan of Action is to prevent and control physical and chemical pollution. High priority will be placed on activities directed to the establishment of policies and legislation for such purposes; the dissemination of information on the assessment, detection, treatment and prevention of deleterious effects resulting from exposure to chemical and physical agents, and the strengthening of national institutions to undertake control programs including the development of legislation and enforcement mechanisms. Emphasis is also placed on the formation of intersectoral relations with the national development planning units and the industrial and agricultural sectors.

Areas of Action

1. Development of policy and legislation for prevention and control.
 - Analysis and dissemination of information on physical and chemical pollutants including data on morbidity and mortality.
 - Designation of national focal points to participate in the International Program for Chemical Safety.
2. Detection, treatment, and prevention of hazards from intoxicants.
 - Establishment of coordination mechanisms with users of physical and chemical agents for prevention, treatment, and control.
 - Incorporation of environmental, ecological, and biological monitoring in prevention and control programs.
 - Education of health service workers and the population regarding newly introduced toxic chemicals.
3. Implementation of policies and plans for prevention and control.
 - Establishment of information systems for management and decision-making.
 - Preparation of guidelines for the establishment of environmental and biological monitoring in prevention and control programs.
 - Promotion of support from manufacturers and users of physical and chemical substances.
 - Development of guidelines and implementation of emergency response mechanisms.
 - Promotion of education and training programs for professionals and technical staff as well as education of the public.

Suggestions for Indicators

- Number of countries with updated policy and legislation for the control of physical and chemical pollution.
 - Identification of morbidity and mortality related to contaminants.
 - Number of countries with information systems in this area.
-

most alarming factors in the degradation of the environment. In Latin America between 1950 and 1980, the population of cities with more than 20,000 inhabitants quadrupled from 40 to 160 million and continues to increase at the present annual rate of 4 per cent. In 1950, there were only six

cities in Latin America with more than one million inhabitants, now there are 25. Between 1960 and 1975, the population of these cities increased from 25 million to 61 million.¹ The dynamics of this urban demographic increase could only result in the invasion by the countryside of the cities.

Industrial water pollution, until recent years considered to be a problem of minor significance in many of the world's developing countries, has now been recognized to be a serious and major health hazard. The importance of economic growth and industrialization as key priorities in developing countries has resulted in preservation of the environment being given less weight. Clearly urgent pollution control measures must now be taken to avoid a major ecological upset, even if this slows down the growth of certain industries.

Rapid deterioration of the environment can occur, particularly in the quality of water flowing through rivers and streams and therefore in the quality of life in rural and urban areas. It will not be possible to sustain long-term growth, development, and an improvement in the standard of living of people if water courses carry toxic chemicals, phenols, and other pollutants which endanger human and animal life. Action should be initiated immediately to prevent further deterioration and to preserve the environment for future generations.

In developing countries water is mainly used for irrigation, while industry seldom accounts for as much as 10 per cent of total use. Therefore, wastewater treatment and recycling are much more important issues in the developed than in the developing countries. The demand for water from industrial and other nonagricultural uses will, however, increase rapidly over the next two decades, causing basic water use conflicts over the allocation of water among agricultural, industrial, and domestic uses. Rising demands from all sectors in terms of both quantity and quality will make it necessary for all countries to consider conservation and pollution control measures in anticipation of future shortages.

Pollution is in fact fouling the rivers and streams of Latin America. Untreated waste from agroindustrial processes and effluents from new factories have destroyed fisheries, reduced available water supply, and impaired agricultural productivity. Water bodies in almost all major urban areas are polluted by untreated organic discharges from human and industrial activities.

¹Data taken from a background document on "Principal Environmental Problems of Latin America" prepared by Prof. Valenzuela Fuenzalida, Catholic University of Valparaiso, for the Ad Hoc Meeting of Senior Government Official Experts in Environmental Law (convened by UNEP in Montevideo from 28 October to 6 November 1981).

During the last two decades, concentration of modern industry, population, and government in larger metropolitan areas in the developing countries has led to disequilibrium in the ecological balance and widespread deterioration in the quality of air and water. In Latin America, rapid industrial development comprising petroleum refineries and large petrochemical and steel complexes in urban areas of Venezuela and Mexico, and metallurgical industries in Peru and Chile, has resulted in high levels of suspended particulate matter in water courses in those countries. In Mexico City foundries, metal processing, ceramic and paint manufacturing, cement production, smelting and other industrial operations contribute to the total pollution burden in the enclosed valley of the city. Latin America will have many of the largest complexes in the world within the next decade, which—combined with large-scale industrialization—can be expected to result in increased environmental degradation.

Many of the developing countries still retain an advantage over developed countries in environmental terms since their use of highly pollutive and nonbiodegradable substances has not yet reached unmanageable proportions. With new treatment technology available, they may be able to avoid the worst pollution and move into cleaner processing methods. As the developing countries become more aware of the dangers posed to their environments by the discharge into rivers and streams of dangerous industrial wastes, they can incorporate preventive measures into their planning processes. The planning of water supplies for urban and industrial purposes must be accompanied by consideration of requirements for disposal of liquid wastes from human, industrial, and other sources. Monitoring of effluents discharged by factories and fines for polluting industries will be essential for enforcement.

Significant advances have been made in the Region over the last few years in preserving and improving the quality of the physical environment. Public awareness of environmental problems, the promulgation of specific laws and regulations, and the creation of new environmental agencies have made it possible to accelerate the assessment of environmental pollution and to initiate control programs. Training on environmental matters—through courses, seminars, and symposia—has mushroomed. Research of environmental pollution has progressed, but still needs amplification. Research projects have been carried out on the effects of atmospheric pollutants on human health, development of low-cost technology for treatment of municipal sewage and industrial wastes, studies of water quality, and characteristics and treatment of urban solid wastes.

The right balance in the approach to environmental pollution must be

found. In the present stage of development of Latin America, the significance of industrial hazards for the general population may be questioned. Scientists and health workers should collaborate with governmental authorities in promoting solutions to environmental pollution problems.

High priority should be placed on activities directed to the establishment of policies and legislation to prevent and control physical and chemical pollution; the dissemination of information on the assessment, detection, treatment and prevention of deleterious effects resulting from exposure to chemical and physical agents, and the strengthening of national institutions to undertake control programs including the development of legislation and enforcement mechanisms.

Chemical hazards are among the most important environmental threat. These include NO_2 , nitrates, nitrites, mycotoxins, manganese, pesticides, asbestos, and others. Modern, industrially produced hazards evince a long time-lag between exposure and effect: an effect not demonstrable today may show up many years from now. Moreover, hazards often affect not only those who are occupationally exposed, but the community as a whole.

The member countries of PAHO and WHO have set priorities, environmental health criteria are being established, and documents on those criteria are being issued. Other measures that should be taken include: establishment of an early warning system for acute and chronic effects; vigilance of trends in large population groups; and awareness and maintenance of chromosome breaks, cancer registries, congenital malformations, blood enzymes, antibody titers, and nutritional indices that can provide information for detecting shifts in health.

Prevention and Control Efforts of the Organization

Since it is important to consider total exposure to a given toxic agent from air, water, food, or soil in the home, at work, and elsewhere, the Organization, in collaboration with the United Nations Environment Program (UNEP), has started a program to assess existing information on the relationship between exposure to environmental agents and protection of human health, and to identify new or potential chemical hazards. The International Program on Chemical Safety (IPCS) completes its second year of activity in 1982. Operational since June 1980, the program was originally conceived in the 1977 World Health Assembly in recognition of the inadequacy of existing national and international efforts to deal with the long-term aspects of human exposure to chemicals. Subsequently it has become a cooperative venture of UNEP, ILO, and WHO. Program priorities include

evaluation and dissemination of scientific information; manpower training and development; risk estimation for chemicals such as household products, pesticides, food additives, and industrial chemicals, particularly those included in the ILO hazard alert system; and development of methodology, as regards epidemiology, experimental laboratory methods, the effects of multiple exposures to chemicals, and extrapolation of experimental data to effects on human subjects.

While it is too soon to evaluate program results, the interest, support, and direct involvement of national institutions of a growing number of countries in different parts of the world are gradually becoming visible, and the existing activities of the cooperating organizations are gradually merging into a comprehensive program together with new activities.

Still other advances have been made as part of the program. The evaluation of the possible effects of chemicals on human health and the environment is so far based mainly on pre-existing activities, namely, the Joint FAO/WHO Expert Committee on Food Additives, the Joint FAO/WHO Meeting on Pesticide Residues, and the *Environmental Health Criteria*. The criteria produced so far include the following:

1. *Mercury*
2. *Polychlorinated Biphenyls and Terphenyls*
3. *Lead*
4. *Oxides of Nitrogen*
5. *Nitrates, Nitrites and N-Nitroso*
6. *Principles and Methods for Evaluating the Toxicity of Chemicals, Part 1*
7. *Photochemical Oxidants*
8. *Sulfur Oxides and Suspended Particulate Matter*
9. *DDT and its Derivatives*
10. *Carbon Disulfide*
11. *Mycotoxins*
12. *Noise*
13. *Carbon Monoxide*
14. *Ultraviolet Radiation*
15. *Tin and Organotin Compounds*
16. *Radiofrequency and Microwaves*

Some 60 more criteria are in preparation, as is a monograph on principles and procedures for establishing environmental health standards.

Publication in Spanish of criteria documents appropriate to the needs of the Americas represents a major contribution of PAHO to the International Program on Chemical Safety. Of the publications issued recently the eighth, on *Sulfur Oxides and Suspended Particulate Matter*, reports the collective views of an international group of experts regarding these substances: their

chemistry and analytical methods; sources; concentrations and exposures; dispersion, absorption, distribution, and elimination; as well as their effects on man and animals and the consequent health risks involved.

The ninth volume, on *DDT and its Derivatives*, presents a broad range of information regarding these substances: their properties and methods of analyzing them, sources and distribution in the environment and consequent exposure levels, epidemiological and clinical studies of their effects on man and animals, as well as the evaluation of health risks due to exposure of man to DDT and its related compounds.

The tenth issue in the Spanish-language series, on *Carbon Disulfide*, reports on various aspects: properties, measuring and sampling methods of analysis, occupational and community exposure, the metabolism and biochemical effects of the substance, poisoning and other effects as a result of exposure, and control measures.²

Another important outgrowth of the IPCS is the evaluation and harmonization of methods for measuring and assessing exposure, for toxicity testing, epidemiological studies, for risk assessment and hazard evaluation. In addition to the basic monographs on the principles and methods for evaluating the toxicity of chemicals, and on epidemiological methods, the IPCS has established three working groups with the task of reviewing and harmonizing existing methods for assessing the mutagenic effects of chemicals, for assessing neurobehavioral toxicity, and for the comprehensive evaluation of risk associated with exposure to chemicals during pregnancy, while the Scientific Group on Methods for Evaluating Exposure to Chemicals, cosponsored by WHO, UNEP, and the Scientific Committee on Problems of the Environment, has set up a working group for evaluating the effects of chemicals on the reproductive function.

The IPCS aims also at the harmonization and mutual acceptability of testing guidelines developed in various countries and/or through other international activities, and first steps in this direction are being taken. Two other priorities, manpower training and emergency response, are at present included in the activities of the WHO Regional Office for Europe.

In addition to the translation, publication, and dissemination of documents in the *Environmental Health Criteria* series, PAHO has established an Interregional Research Unit at the National Institutes of Environmental Health and Safety in Research Triangle Park, North Carolina. Existence

²Copies of these publications can be obtained on request through the Pan American Health Organization, 525 Twenty-third St. N.W., Washington, D.C. 20037. The prices of individual volumes vary.

of the unit should result in further support to the global environmental health program of the Organization and related regional activities.

PAHO staff reviewed interim documents prepared by the WHO Regional Office for Europe on the subjects of emergency response to chemical accidents, manpower development for control of chemicals, and a progress report on the study of health aspects of chemical safety, prepared as part of the IPCS. Work also continued on the publication of a volume on principles and methods for evaluating the toxicity of chemicals, which would be available in 1982.

A meeting of an IPCS working group was held at the end of 1981 to examine methods for the integrated evaluation of risks for progeny associated with prenatal exposure to chemicals. In addition, in collaboration with the emergency preparedness and disaster relief unit, a plan of action was being developed that would include the participation of CEPIS and ECO.

PAHO staff was active in promoting the Plan of Action for Environmental Protection and Improvement of the Wider Caribbean Area as well as in supporting UNEP-sponsored activities related to it. The aim of the plan is sound environmental management through improvement of the capabilities of countries to assess and rationally utilize their resources; strengthening of the monitoring of changing environmental conditions; and coordination and technical cooperation among governments and specialized agencies in execution of the plan. At two meetings of government-nominated experts, held in Managua and Jamaica in 1981 and conducted with PAHO cooperation, environmental health projects related to pollution, namely water pollution and drinking water quality, received priority attention (for more, see pages 148-149).

The results of the Pan American Air Sampling Network (REDPANAIRE) initiated by PAHO in 1967, are discussed in detail in the final report of the work of the Network, published in 1982 and available through the Pan American Center for Sanitary Engineering and Environmental Sciences (CEPIS). Among findings taken from over 100 stations in countries throughout the continent, it was demonstrated in the course of REDPANAIRE operations that: 70 per cent of samples of settled particulate matter, 20 per cent of samples of suspended particulate matter, and 28 per cent of those of sulfur dioxide were above the standard reference levels, indicating excessive pollution. These results represent merely a first approximation to adequate understanding of the problem. In cities where air pollution is serious, monitoring programs should be stepped up.

Of a similar nature, CEPIS is collaborating with WHO in the operation of a global air quality monitoring network. A number of stations throughout the hemisphere are involved in this network, and the results of their data

collection are being transmitted to Geneva. The Center also cooperates with the individual countries on research projects directed primarily toward determination of previously unmeasured pollutants.

CEPIS is cooperating in the provision of tools for the evaluation of the health and socioeconomic impact of environmental pollution and in particular of the use of dangerous or high-risk substances in the environment. It also develops mathematical models for the evaluation of water quality control programs and other methods and activities in collaboration with regional programs in air and water pollution monitoring networks, and analytical quality control in water and wastewater laboratories.

CEPIS has undertaken a study to establish a simplified methodology for the evaluation of water quality in tropical lakes—especially for the analysis of such problems as pollution and eutrophication. In the development of this program, collaboration is expected from other possible cooperating centers in the area of research.

The Center is collaborating with the Environmental Protection Agency of the United States in a study of analytical quality control in the laboratories of the Region. Control samples for the determination of trace metals were distributed to all national laboratories collaborating in the GEMS/Water Program, as well as to those participating in PRELAB. Some 105 laboratories in 23 countries are involved.

The Pan American Center for Human Ecology and Health (ECO) is looking into the possibility of conducting several collaborative projects with the government of Brazil. One of the projects proposes the epidemiological monitoring of environmental risks, to correlate information on the presence of certain environmental pollutants and the occurrence of specific diseases, given the need to collect data on the morbidity/mortality associated with those pollutants.

Another ECO project aims to develop a methodology for the evaluation of health effects due to environmental modifications including aspects related to the physical, biological, and social environment to achieve a comprehensive, balanced understanding of the problem.

A third project being conducted by the Ecology Center involves participation of Brazilian nationals in a training program for prevention of risks due to pesticides, given the rise in number of accidents and poisonings that have occurred as a result of their misuse.

Programs Ongoing in the Countries

Activities in pollution prevention and control carried out at the country level during the period under consideration included those outlined below:

Belize. One of the objectives of the national health program is the reduction of pollution of water and the environment from industries and other sources.

Bolivia. The Institute of Sanitary Engineering continued its affiliation with the GEMS/Water project and incorporated a new monitoring system. Similarly, arrangements were made to have it serve as a collaborating national center in the REPIDISCA network and as a central reference laboratory for the National Drinking Water Quality Control Program.

Brazil. PAHO played the role of executing agency for a number of projects funded by the UNDP for the purpose of controlling and preventing pollution. One was completed in 1980 and aimed at developing the environmental control program of Rio de Janeiro State. It resulted in several recommendations, including recovery of Lagoa Rodrigo de Freitas; air, water, and soil pollution control; solid waste management; improvement of heavily polluted Guanabara Bay; and preparation and control of pollution in Paraíba do Sul River.

The Organization collaborated with the São Paulo State Company for Technology in Basic Sanitation (CETESB) in environmental pollution control, a program supported by UNDP funds. Institutional development, pollution control through preparation of mathematical models for water quality forecasting and the establishment of monitoring networks, solid waste management disposal studies, recommendations of guidelines to control urban noise pollution, and training in environmental pollution control figured among the accomplishments of technical cooperation. In addition, CETESB—with PAHO cooperation—will undertake execution of an environmental control program and an industrial pollution control project, funded by the World Bank, which aims at the reduction and control of industrial wastes.

Environmental studies for the basins of Lakes Paranoá and Descoberto in Brasília were the subject of another UNDP-funded project in which PAHO participated; among its results were water chemistry and sediment stratigraphy studies, a sewage treatment methodology, lake ecology, and training—all aimed at formulating a plan for the recovery of Lake Paranoá and for the maintenance of water quality in Lake Descoberto.

PAHO offered assistance to the Health and Environment Secretariat of Rio Grande do Sul State in relation to the control of environmental pollution due to petrochemical and carbochemical complexes.

Colombia. Environmental pollution prevention activities have intensified due to a growing demand of the population for the solution to specific air pollution problems resulting from industries in different parts of the coun-

try. The Health Code Regulation is undergoing revision in respect to the chapters of air and water pollution, after which it will be submitted to legal review. Colombia participates actively in international programs such as GEMS/Air and GEMS/Water. A number of officials in the sector have gone abroad to study the experience of other countries in environmental pollution control and monitoring technology. This kind of exposure is vitally important to the broadening of national expertise in the sector, and PAHO assists this activity through the awarding of fellowships to attend courses in foreign countries. The country has acquired high volume equipment to measure suspended particulate matter, which is one of the main problems in regard to air pollution. Through the PRELAB program coordinated by CEPIS, laboratory quality control is made possible. The study of the pollution of Cartagena Bay is ongoing and an in-depth study was made to sample and analyze water quality and a mathematical model was done of the Bay's water quality. PAHO assisted in review of the progress of the project and recommendation of activities that should be carried out, and provided fellowships and equipment so that the project could be furthered. The government of Colombia is concerned about pollution in the Bogotá River and has assigned a number of officials to study river basin protection and management. One of the contributors to the problem is the presence of tanning industries that dump their effluents in the river, and PAHO has provided advisory services and fellowships to look into the matter; equipment is also being procured to strengthen the existing laboratory for wastewater and water quality control.

Several pollution control projects were carried out in Colombia. PAHO facilitated development of the Cauca River watershed through the further training of professionals in travel seminars to industrialized countries that practice watershed management. Advisory services were offered on design and location of industrial waste treatment plants and use of chromatography equipment for pesticide analysis.

The Organization provided partial support to a project aimed at researching, monitoring, and controlling pollution in Cartagena Bay and surrounding areas. Technical cooperation involved limited advisory services, training courses for officials in the city of Cartagena, and provision of some equipment.

PAHO and Colombia signed an agreement for technical cooperation in protecting the Bogotá savanna water resources. Specific assistance included advisory services in the organization required for integrated control and management of the basin of the Bogotá and Suárez Rivers as well as establishment of water quality criteria and standards in accordance with

water uses and their impact on health. Collaboration began on studies of pollution caused by industrial liquid wastes, especially those resulting from tanning processes.

A project on wastewater treatment and disposal in the city of Bogotá received PAHO support through advisory services in analysis of alternatives to wastewater treatment and in water chlorination and through the facilitating of travel seminars for five professionals to different countries in Latin America.

Costa Rica. PAHO assisted in a diagnosis of the water pollution situation, identifying discharges of pollutants and making an inventory of them. The legislation on water pollution, as well as water resource quality standards and goals, were reviewed. It also assisted in the design of an air pollution control program for metropolitan San José and in the revision of the regulation of the General Health Law in regard to air pollution. It participated in a diagnostic study of the soil pollution situation, determining the principal sources of polluted discharges into the soil; the laws in this respect were studied, quality measures were adopted, and staff trained. In the preparation of a soil pollution control program—in the face of a health-threatening problem that originates from urban solid wastes, harvest wastes, and chemical substances used in farming—the first phase of a control project recommended that a program be initiated to study the pesticide and solid waste situation, that symposia be held on collection systems and the design and operation of sanitary landfills, and that intragovernmental activities be coordinated to ameliorate the situation.

Guatemala. The country is carrying out activities preliminary to establishment of an air pollution control program and the study of air quality standards. The current situation was analyzed regarding air pollution in Guatemala originating from industry and automobiles, as were the consumption of combustibles, zoning in metropolitan Guatemala City, meteorological conditions in the central region of the country, and evaluation of air pollution in the capital. Recommendations included a proposal for the creation of an air pollution prevention and control program as well as suggestions as to how to expedite implementation of such a program.

Panama. Given the problem of offensive odors in Panama City, the government requested PAHO technical cooperation in the identification and preliminary analysis of the problem. As a result of advisory services, it was determined that certain fish flour processing plants were the cause of the odors. Recommendations were made to the industries involved and the proper authorities as to how to solve the problem. Environmental impact caused by copper mines was another subject of PAHO technical cooperation.

Peru. PAHO sponsored a study that developed a methodology to analyze pollution of coastal waters in Peru, which specified the obtaining of hydrologic, topographic, oceanographic, and water quality data; determining polluted discharges; carrying out sampling, analyses, and complementary tests; developing water quality models; and applying those models to examine short- and long-term activities. It was decided that the methodology be applied initially to study the water of the Metropolitan Lima Coast. In particular, efforts sought answers to questions regarding recreational conditions and action that could be recommended to preserve adequate water-contact sports. Existing data were collected and agreements signed with several agencies in order to bring together preliminary field and laboratory information. The water quality model was developed, specifically for coliform bacteria. It was concluded that coastal pollution is not caused by cloacal discharges; rather it results from public use.

One of the most important projects to the development of certain regions of the country is that involving research into the health implications of reuse of treated wastewater; it will permit the Health Ministry to establish standards and promote programs for agricultural reuse and forestation. Proposals to broaden the project to include risks in fish culture were presented to the International Research and Development Center of Canada. Sampling and studies are being carried out to develop similar models to that used to study waters along the coast of Metropolitan Lima. With the cooperation of CEPIS and PAHO country office staff, a program was elaborated and approved for the creation of a Quality Control Office and implementation of a corresponding plan of action.

Venezuela. A project on environmental pollution research, funded by UNDP and executed by PAHO, aimed at the development and strengthening of a national directorate for environmental research. Project activities included: integrated studies on water pollution in Lakes Maracaibo and Valencia, studies of air pollution in the Caracas Valley, development of a sanitary landfill in Isla Margarita, research on stabilization lagoons, and analysis of the impact on the environment of petroleum industries.

Food Protection

Situation in the Americas

Sound scientific evidence has demonstrated unequivocally that what people eat has a major impact on their health—for good or for bad. In addition to its nutritional aspects, food serves as a means by which man can be exposed to toxic agents. Foods interact with the three basic environmental components: air, water, and soil and thus may be contaminated with chemical or biological agents.¹

In most countries of the Americas, many foods arrive at the consumers' table at the end of a long chain of steps involved in production, processing, distribution, and marketing. Toxic agents may enter the chain at any one or more of these steps. In addition, many foods provide excellent substrates for the growth and multiplication of dangerous microorganisms—so that, once introduced, the organism may grow rapidly. Finally, man stands as the ultimate consumer at the head of many food chains and thus, by reason of biomagnification, may be exposed to concentrations of toxic agents which are orders of magnitude greater than those to which other species lower down in the chain are exposed.

Prominent among the illnesses produced by contaminated foods are those of microbial origin—the well known “food poisoning” episodes, but increasing use of chemicals in food production and processing gives cause for alarm about chemical contamination. Such contamination may be very difficult to detect except by use of sophisticated analytical procedures, symptoms of disease may not appear for many years after exposure, and adverse effects may even appear only in subsequent generations.

Food control in the Americas must be seen against a background of food

¹This and the paragraphs that follow in this introductory section have been adapted from an address given at the PAHO Technical Discussions on Sanitary Control of Food (Washington, D.C., 1981) by A. B. Morrison, Assistant Deputy Minister, Health Protection Branch, Department of National Health and Welfare, Ottawa, Canada.

The Technical Discussions are to be published by PAHO in Spanish and English in 1982, and copies can be obtained on request through the PAHO Distribution Unit, 525 Twenty-Third St. N.W., Washington, D.C. 20037.

shortages—in terms both of quantity and quality of foods available for consumption—and of maldistribution of food supplies. Protein/energy malnutrition, anemia, vitamin A deficiency, goiter, and obesity are endemic in many countries of the Region. In addition to its direct effects, malnutrition plays a major role in determining the virulence of common infectious diseases, such as measles and chickenpox, and in influencing the overall capacity of the body to ward off disease. The interaction between nutrition and infection is perhaps most crucial in the first three years of life. By reducing the quality and quantity of food available, contamination accentuates the already grave problems of malnutrition.

Population numbers throughout the Region are growing faster than is food production. Rapid but disorganized urban growth is common; the result is increased dependence on foods produced other than locally. Domestic costs of producing food can be expected to accelerate during the next decade as a result of inevitable increases in the cost of petroleum and petroleum-based products such as pesticides. This will widen even more the current gaps between the demand and the supply of food.

Food control problems in the Americas must also be seen against a background of increasing dependence by many countries on imported foods, which may or may not be produced, processed, stored, or distributed according to the standards of the importing country. Increasing costs of imported foods, as well as the protective measures required to assure their quality, will put ever heavier economic burdens on national governments over the next decade and increase the need for policies aimed at developing greater national self-reliance in food protection.

The food industry in the Americas is characterized by large numbers of small or medium-sized firms. Many of these lack the capital, facilities and trained personnel for proper quality control. Inadequate attention often is paid to problems of sanitation in production, processing, storage, and distribution. Adequate storage facilities, including refrigeration, often are lacking, and transportation and distribution procedures and mechanisms are deficient. The amount of food available for sale and use is further decreased by significant losses resulting from contamination during production, processing, storage, and distribution, by rodents, insects, bacteria, moulds and other causes or vectors of disease. In short, the infrastructures and expertise necessary for proper sanitary control over foods at all points in the production-processing-storage-distribution chain are lacking and do not function effectively in most countries of the Region.

The effects of all of these problems on public health are unquestionably

very large, but are difficult to quantify from available information. Inadequate epidemiological surveillance mechanisms in most countries of the Region make it difficult to quantify the numbers of people who are made ill or otherwise damaged by contaminated foods. Diarrheal diseases, in the etiology of which contaminated foods play a significant role, are known to be the leading cause of death in at least five Latin American countries. Similarly, the economic impact of the public health problem, both direct and indirect, is difficult to quantify. For example, several studies have shown that the fear of sickness, especially diarrhea, is a major deterrent to potential visitors to developing countries. By extrapolation from data in the United States and Canada, which have relatively well developed mechanisms for surveillance of food-borne illness, however, the approximate health and economic dimensions of the problem can be estimated to be in the millions of people and billions of dollars annually.

Most countries in the Region have some sort of food control service, but in nearly every country there are severe constraints on the ability of these agencies to carry out their work effectively. A major problem is lack of a firm national commitment to a safe food supply. In many countries there is an inadequate legislative base to effectively deal with complex problems of food control. Most countries do not have a clearly defined and articulated food policy, and perhaps as a result fragmentation of efforts between various ministries of the national government is apparent. Coordination between the various agencies is often inadequate and is hampered by competition for staff, funds, and prestige. Enforcement of existing laws often is inadequate, both qualitatively and quantitatively, and analytical support for inspection activities is likewise deficient in quantity and quality. These problems at the national level are duplicated at state or provincial and municipal levels, and coordination between levels of government is faulty.

At every level and in every food control activity in almost every country, there are grievous and growing shortages of trained staff. Without adequate numbers of competent and dedicated people to direct and operate food control agencies, lasting solutions to any of the problems described cannot be found.

What then must be done by national governments to assure safe food supplies are available to the people of the Americas? There are no easy solutions. The problems are deeply engrained in the economics and history of the Region and are, indeed, common to developing countries throughout the world. They are rooted in poverty, neglect, exploitation, and ignorance. No single unit of government is capable of resolving them: multinational commitment and cooperation are essential. Notwithstanding

the difficulties involved in reaching proper solutions, however, there is much that can be done, and indeed must be done, by governments during the next decade. The following action strategies are suggested:

- Establish food control as part of primary health care.
- Develop sound legislation that is sufficiently flexible to keep up with changes in technology and science.
- Assign an important but not necessarily exclusive role to health ministries in developing and administering national food control policies.
- Strengthen inspection services.
- Develop analytical services to work in close cooperation with inspectors.
- Establish good manufacturing practice guidelines to ensure quality control for high-risk foods moving in international commerce and as a prerequisite for valid quality certification agreements.
- Develop quality certification agreements for food moving in international trade between countries.
- Increase information exchange among national food control agencies.
- Expand training and development programs to provide the necessary cadre of trained personnel.
- Expand public and private sector education programs.
- Make full use of the expertise in international agencies.

The Regional Program of the Organization

The problem of food safety becomes even more apparent when considering the extent of malnutrition in many developing countries. On World Food Day, 16 October 1981, WHO Director-General Halldan Mahler noted that at least one in four people in the developing world has food intake below the critical minimum level; moreover, the burden of malnutrition is heaviest for children who, lacking nutrition and safe water, become the live prey of killer diseases. He thus declared World Food Day “an occasion for the health sector to rededicate itself to greater efforts to reduce malnutrition and lessen its impact. The priorities include reduction in diarrheal and other infections, provision of safe drinking water and adequate sanitation, better spacing of births, proper child immunization, promotion of breastfeeding and good weaning practices and improved nutrition education, as well as attacks on specific nutritional deficiencies.”

In Latin America and the Caribbean specific nutritional problems persist such as iron-deficiency anemia, hypovitaminosis A, and endemic goiter—problems which could be reduced through effective appropriate technologies applied country-wide. Such technologies include sugar fortified with vitamin A, iron-supplemented salt, iodized salt, enriched wheat flour and amino-acid enriched corn. Despite the fact that the situation

regarding nutrition poses less severe problems in the Region of the Americas than in Asia and Africa, malnutrition and inadequate environmental conditions do act synergistically in the face of acute infectious processes, aggravating them to the point of high infant morbidity and mortality rates.²

The Ministers of Health of the Americas have recognized that—as a result of these and other factors, some of which are not within the health management system—millions of people in the hemisphere are made sick by contaminated food, and thousands die as a result each year. During the XXVI Meeting of the PAHO Directing Council, the Ministers of Health adopted Resolution XXXIII, which specified selection of “Sanitary Control of Food” as the subject of the Technical Discussions held during the XXVIII Meeting in Washington, D.C. in September 1981. The discussions aimed to provide the health authorities of the Member Governments an opportunity to identify ways of accelerating the promotion, planning, coordination, and development of food safety services.

The discussions included a variety of subjects dealing with food control, among them national food policies, national food control services, quality assurance, organization and coordination of food-related governmental services, legislation, food inspection and compliance, analytical services, manpower development, financial considerations, self-inspection in industry, community participation and public education, the role of international organizations, and technical cooperation among developing countries.

The participants gave consideration to the incorporation of food safety into the national and regional strategies for attaining the goal of health for all by the year 2000, including the sanitary handling of food as an integral part of primary health care.

Emphasis was placed on the strengthening of institutions which should be accompanied by a massive program for training personnel at all levels and should be conducted in each country or in groups of countries with the help of existing national resources. In this regard, the Organization has a regional education program in food protection and has sponsored courses for approximately 1,000 health workers from the Americas.

Taking into consideration the Final Report of the Technical Discussions, the Council adopted Resolution XXXIX calling for the Governments to

²Taken from a presentation made by Dr. Carlos Daza, PAHO/WHO Regional Adviser in Nutrition, at a commemorative celebration of World Food Day held on 16 October 1981 at the Organization of the American States, Washington, D.C.

establish a national coherent food protection policy, intensify the participation of the health sector in the food supply system, provide educational programs in all aspects of food safety principally for mothers and children, and strengthen institutional development accompanied by massive training of personnel at all levels.

The regional advisers in the food safety program of PAHO and WHO and staff of FAO participated in the Technical Discussions, after which they met to plan, design, and prepare the global strategy for food safety for the various regions of WHO. Recommendations that emanated from that meeting emphasize the significance of developing food safety programs by governments of all WHO regions within the plan of action of primary care for health for all by the year 2000; food safety as an essential component of primary health care; strengthening of institutions accompanied by a massive personnel training program; and development of guidelines for the Member Governments that indicate the sources and methods of procurement of extrabudgetary funds from lending agencies.

Plan of Action

FOOD PROTECTION

Approaches

The Plan of Action is oriented toward improvement and expansion of the food protection program into effective food control systems that would cover the needs of the urban centers and the less privileged marginal population groups that are particularly exposed to contaminated food and that experience a greater prevalence of food-borne diseases.

In implementing the Plan, food control programs should be integrated with overall health programs and the development of food control services. High priority should be given to the training for food administrators, food inspectors, and laboratory workers at different levels not only in government but also in the food industry. A special effort should also be made to provide public education about various aspects of food safety, particularly on simple hygienic procedures for preparing, storing, and cooking food at home.

Areas of Action

1. Formulation of national policies for the protection and control of food quality in production and distribution.
 - Development of criteria for the formulation of policy.
 - Inclusion of management principles and practices in food supply systems.
2. Expansion of the participation of the health sector in food safety.
 - Promotion and participation in the identification and application of policies and quality control procedures to assure a wholesome food supply with special emphasis on less privileged marginal populations
 - Optimization of the cooperation and linkages with all agencies involved in food protection and food trade.
3. Strengthening of food protection programs.
 - Assessment of institutions' administrative, technical, and operational needs, and development of organizational needs, and of organizational and management information systems.
 - Improvement of food analysis services.
 - Development, upgrading, utilization, and application of acceptable standards and requirements.
 - Formulation of effective food inspection services with improved operational practices.
 - Cooperation in the strengthening and development of laboratory support capabilities for food protection programs including food microbiology.
 - Stimulation of the interest of general consumers in the application of the principles and practices of sanitary handling of their food.
 - Assessment of existing infrastructure and identification of priorities related to the microbiology of food of animal origin.
 - Cooperation in the development of appropriate technology for hygienic processing of food of animal origin to meet the needs in rural and urban areas.
 - Cooperation in the development of a comprehensive food protection strategy and plan of action.
 - Participation in the development of cooperative projects for production and hygienic processing of milk and small livestock.
 - Design and development of epidemiological surveillance programs.
 - Cooperation in the development of uniform codes and guidelines for meat inspection.

Suggestions for Indicators

- Number of countries which have a national policy on food protection, with programs in operation.
- Reduction in morbidity and mortality of food-borne diseases.
- Diminution of food losses due to wastage and contamination.
- Volume of meat and milk processed under sanitary control.
- Percentage and causes of confiscations at slaughterhouses.

Programs Ongoing in the Countries

The Organization provides technical cooperation to the countries in the form of advisory services in support of national food protection programs. It is involved in the FAO/WHO Codex Alimentarius Commission and the Joint FAO/WHO Expert Committees on Food Additives and on Pesticide Residues. The Codex Regional Coordinating Committee for Latin America is of particular value in identifying problems and developing solutions.

Activities related to food protection in several of the countries are highlighted below:

Fifteen food inspectors from *Colombia, Dominican Republic, Peru* and *Venezuela* were trained under the Regional Education Program for Food Protection at the National Public Health School of Antioquia University in Medellín, Colombia, in October 1981.

Belize. One of the primary objectives of the national health program is the improvement of food hygiene practices in the country.

Colombia. PAHO has provided advisory services in the training of personnel and the formulation of standards and regulations in the area of food control, in the interest of decreasing risks of morbidity and mortality due to toxic infections related to food and of avoiding the deterioration and loss of food as a result of contamination. A number of fellowships were awarded in this field to strengthen the national food control program, and assistance was provided in the preparation of audiovisual aids and the acquisition of laboratory material and biologicals not available within the country.

Costa Rica. PAHO worked with national authorities to prepare studies aimed at strengthening the food protection program, including the following activities: diagnosis of the situation, design of a food protection service and an information and epidemiological surveillance system; revision and expansion of legislation and existing food protection standards; a study to

upgrade the operating capacity of the existing food control laboratory; a study aimed at organizing the register of national foods; formulation of a training program for staff at all levels, including a component for food handlers.

Chile. Training was provided by PAHO to national staff in food protection.

Guatemala. PAHO provided assistance in formulation of a program for the sanitary control of milk with emphasis on the operation of pasteurization plants; for this purpose, 40 supervisory personnel were trained. PAHO also cooperated in the organization and holding of three courses on food control and hygiene.

Paraguay. PAHO participated in the study of the program of control of food locales, including the distribution of more than 500 tons of food to rural communities.

Assessment of the Impact of Development on Health and Ecology

On 11 February 1982 the Director of PAHO, Dr. Héctor R. Acuña, addressed a meeting on the role of WHO in human ecology and health held at the Pan American Center for Human Ecology and Health (ECO) in Metepec, Mexico. Following are some of the highlights of that address.

Development and economic growth are basic goals of all the Organization's member governments. During the next few decades, billions of dollars will be invested in social, industrial, and resource utilization projects. All the nations of the hemisphere are under intense pressure to exploit energy resources, improve agriculture, utilize new territory, and develop industries.

In considering the environment and development, the health sector's primary focus must always be on people's health and well-being. This is fundamental to the philosophy behind the goal of health for all by the year 2000, which recognizes the close and complex links that exist between health and socioeconomic development and the fact that, therefore, the strategy of health for all should be based on the mutual reinforcement of health development and socioeconomic development policies.

It is now broadly recognized that healthy people, and the energy they expend in intellectual and physical labor, provide a crucial input for development. At the same time, health is an important product of development, because health depends first and foremost on such factors as nutritious food, safe water, a clean environment, decent shelter, safe working conditions, and an effective health care system that places due emphasis on prevention. Economic growth can contribute substantially to bringing about these conditions; however, emergence of such conditions will also depend in large measure on how economic growth takes place. Hence, to a considerable degree, developing countries can avoid the environmental damage that has accompanied industrialization and urbanization in developed countries by applying the knowledge and experience the latter have gained.

The term "human ecology" in relation to human health problems can be defined broadly. Consequently, one must be pragmatic in defining the

role of the Organization in this area, particularly since needs always exceed available resources, and broad coverage of the field as it relates to health is beyond Organization capabilities. It is therefore essential that a few of the critical problem areas facing the countries be identified, with an eye to developing a plan of action.

Industrial development is estimated to have achieved only 10 per cent of its potential in the Third World. In Latin America, where more progress has been made, about 80 per cent of the area's industrial growth is yet to come. Thus there is a great opportunity to plan industrial development, taking into account the relationship between technological and economic progress and environmental values. Damage to the environment and human health can be prevented only if reliable information on the environmental impact of development projects is available at the planning stage of those projects or before their consummation.

The countries of the world are also experiencing unprecedented population growth and resource exploitation. In Latin America, where more than half the population is still living in rural areas, major cities are expected to become some of the world's largest urban complexes within the next two decades. The sheer magnitude of this continued urban growth, especially with respect to population density and industrial development, creates environmental degradation that has adverse effects on human health, economic development, and ecological balances—effects similar to those now being experienced by most highly industrialized nations. Furthermore, ecological problems are so complex that uninformed interference with ecological balances may have a critical impact, not only in terms of economics and esthetic values but also in terms of human survival.

In this same vein, population growth demanding increased food production brings with it many problems—including those associated with poor agricultural practices, soil erosion, excessive fertilizer runoff, and overexposure of agriculture workers to hazardous chemicals.

Over the past few years, world attention has focused on energy needs, and current high energy costs have stagnated economic development in many developing countries—a circumstance requiring stepped-up investigation of alternate energy sources, most of which have environmental problems associated with their development. Among these alternatives are biomass resources and large hydrologic development projects.

In this regard it should be kept in mind that modification of the physical environment by a single undertaking, such as construction of a dam, can affect the flora and fauna of a large geographic area and have a profound impact on vector-borne diseases. In addition, such water development proj-

ects can produce adverse health effects resulting from the influx of workers and settlers to the project site—workers and settlers who may penetrate sparsely populated forests, become vulnerable to disease, and bring about changes in biological and ecological conditions.

The notion that social, educational, and health programs must accompany industrialization is an increasingly accepted concept. Many individuals and government representatives have stated that their countries need technical cooperation to help formulate and implement environmental and health impact assessments of development projects. Most international and bilateral financing agencies are actively engaged in such environmental assessments. It has been the experience of the Pan American Health Organization, however, that Ministries of Health approached in this connection generally say they have relatively limited capacity to conduct the extensive investigations required.

Therefore, consideration must be given to integrating and analyzing existing knowledge, fostering links between sectors within social systems, and evaluating the consequences of planned and unplanned actions. Governments should be assisted in studying the effects of development programs on health, designing ecological strategies for the control of diseases, analyzing the risks to health from environmental pollution, and helping to train local scientists. In cooperation with other agencies, PAHO is preparing guides that will identify the critical parameters and methodologies needed to develop health impact assessments, in the expectation that these documents will provide governments with the information needed to initiate their own assessment programs.

Health authorities are also greatly concerned about the present lack of organized and conveniently available information on human health effects of environmental influences. Such information is of critical importance to planning and other official agencies seeking to place development and the human health consequences of development in proper perspective.

Much technical and other information required for the sound planning needed to avoid adverse environmental conditions is available in institutions around the world. The characteristics of industrial processes that produce offending contaminants and cause damage to the environment and human health are, in large measure, quite well known. Likewise, measures for preventing damage from such industrial processes have been developed. Indeed, much more information on damage prevention and control measures is available than is actually being utilized. It is also true, of course, that in some instances there may be a need for adapting this information to local conditions; and in other cases the prevention and control

measures may be improved by further study and investigation. What is needed, then, are mechanisms for creating a monitoring network and for collecting, analyzing, and using this information in developing control programs. The overriding need is to act—and to avoid deferring action—until we have exhaustively defined the nature and extent of the problems or have acquired a complete understanding of the interrelationship of the causative factors.¹

The Regional Program of the Organization

The Pan American Center for Human Ecology and Health (ECO)—which was established as a mechanism for achieving a better understanding of the health aspects involved in the interrelationship between man and his environment—is oriented towards providing technical cooperation to the countries in the areas of environmental toxicology, ecological strategies for disease control, chemical disaster preparedness, impact on health of socioeconomic development projects, and occupational health.

¹The full text of Dr. Acuña's address in Mexico is due to appear in the *Bulletin* of the Pan American Health Organization, 1982.

Plan of Action

PREVENTION OF ADVERSE EFFECTS OF HYDROELECTRICAL, AGRICULTURAL, AND INDUSTRIAL DEVELOPMENT PROJECTS ON HUMAN HEALTH AND ECOLOGY

Approaches

This Plan of Action is directed at identifying, assessing, preventing, and controlling the possible adverse effects of river basin, agricultural, and industrial development projects. Priority will be given to the development of policies and legislation that include consideration of health and human ecology in the planning, implementation, monitoring, and control of related hazards. The health sector should encourage the preparation of

guidelines so that impact assessments can be conducted and prevention and control measures can be incorporated in the various phases of development projects.

Areas of Action

1. Establishment of policies and legislation for incorporation of health aspects in development projects.

- Promotion of policies and legislation to ensure participation of the health sector in prevention and control of the negative effects on human ecology and health of development projects.
- Adoption of policies and legislation for protection of water catchments to enhance the quantity and quality of water.

2. Participation of the health sector in planning and implementation of projects.

- Formulation of methodologies for assessing the impact on health and human ecology of development projects and for incorporating prevention and control measures into these projects.
- Development of guidelines for action on the direct and indirect effects of various types of development projects on human ecology and on water quality where appropriate.

3. Development of support mechanisms.

- Promotion of mechanisms for education, training, transfer of experiences and knowledge, and dissemination of technical information.

Suggestions for Indicators

- Proportion of development projects in which health and human ecology impact assessments have been made.

Many developing countries have already become aware of the necessity for predicting the impact a new development or industry will have on the environment before it is implemented. Such a prediction is called an environmental impact assessment and is often required by governments from investors in the form of an environmental impact statement. The concept of environmental impact assessments is only recently being introduced in

Latin America. The importance of such analyses will become more apparent as national and international funding agencies require consideration of environmental impact as a condition to loans or grants for development projects.

In performing assessments of the impact on the environment of development projects—an area in which ECO is providing collaboration to a number of countries—it is important to consider:

- Identification of specific health problems that could be exacerbated by the impact of project development. Methodologies for environmental impact studies cannot be easily extrapolated from one project to another; they have to be tailored to the social, political, and economic conditions of the specific situation.
- Provision of alternative solutions to eliminate or minimize change consequences that could result in adverse effects on health.
- Improvement of life styles of the population affected by the development project.
- Coordination and collaboration with other sectors of research in human ecology and health.
- Development of an adequate infrastructure to promote and maintain research; support to institutions and individuals interested in research; identification and development of leaders in the field who in turn could further develop other staff.
- Promotion of an awareness of the health implications of development projects. One of the important scientific developments of the past two decades has been the enhanced appreciation of the extreme importance of interrelationships that exist in nature, of their complexity and their fragility. The ecological approach has become much more prevalent. Still more research should be carried out, however, to assess health impairments and to measure the impacts of environmental conditions on the physical and mental well-being of man.

In order to optimize protection of health and the environment in the planning stage of development projects, information should be organized and made available on human health effects of environmental influences, in order to elucidate the corresponding cause-and-effect relationships. These relationships, preferably quantified, will provide the basis for developing preventive and control measures.

Human ecology information systems, as such, do not exist. In the Americas, the structure of the existing information in the various disciplines often lacks integrity and coherency and relates—not always efficiently—to the style of development pursued, regardless of the need for a human ecological approach. The complexity of information needed in human ecology implies the development of a system that integrates the knowledge of numerous disciplines, oriented to the solution of concrete problems such as those described in the preceding paragraphs.

Cooperation with the Countries and Other Sectors

Recent activities carried out by ECO (other than those in the areas of pollution prevention and control and occupational health, which are reported on in the corresponding chapters) in collaboration with the countries and other PAHO units include those described below:

- *Environmental epidemiology* has been an area of concern to the government of Mexico State, which requested ECO collaboration in the formulation of a program on the epidemiological surveillance of major environmental risks. Also, a Latin American workshop was held in September 1981 in Mexico on epidemiological methods for evaluation of the health effects of environmental pollution. Educational materials were in preparation on applied ecology and protection of the environment as well as on health effects and prevention of environmental risks.
- *Environmental toxicology* was the subject of an ECO-assisted regional course on analytic methods.
- *Ecological strategies for disease control* is an area of activity that included preparation of a guide on the subject, an annotated bibliography on the use of aquatic plants for treatment of domestic wastewater, information on the effect of pesticides on nontargeted populations, and techniques for the study of ecological aspects of diseases produced by development projects.
- *Chemical disaster preparedness* was the subject of a project proposal outlined in collaboration with the PAHO unit for disaster preparedness and emergency relief.
- *Assessment of the impact of socioeconomic development projects on health* received continued support from ECO, which pursued a number of efforts, namely through: provision of advisory services to the recolonization of people resultant from the El Cajón hydroelectric project in Honduras; preparation of guidelines for the evaluation of impacts on health of large dams; elaboration of material for a UNEP-sponsored meeting on Inter-Agency Cooperation for the Environmental Regulation of Dams and Hydrographic Projects, held in Venezuela in early 1982; participation in several coordinating meetings for interagency planning of the Caribbean Regional Project; collaboration in the analysis of health problems related to industrial development in the Bahamas—among other activities. In addition, preliminary interest

was expressed in receiving Center support for environmental health studies related to construction of El Madrigal dam in the Dominican Republic; ECO cooperation was requested for evaluation of the ecological damage and possible health implications due to industrial contamination of the islands of the Netherlands Antilles; Brazilian authorities expressed interest in cooperation in the ecological evaluation and the health effects due to mercury and lead pollution in Todos Os Santos Bay.

Women and Environmental Health

The ten-year period 1975–1985 has been designated the United Nations Decade for Women, proclaimed in order to draw attention to the problems faced by women in their daily lives—ones which in turn impact on their families and communities at large. Many of these problems are environmental in nature, i.e. they relate to access to basic sanitary services and involvement in occupational pursuits. Environmental health protection programs designed to address those problems should be considered a key aspect of the effort to enhance the socioeconomic conditions and general well-being of women.

The Regional Plan of Action for Women

PAHO is working diligently to integrate its Five-Year Plan of Action for Women in Health and Development (see insets) with the Regional Plan of Action for Health for All. Areas of environmental health activities that are relevant to the issue of women include: involvement of women through effective community participation in planning, building, managing, and operating water supply and sanitation systems; improvement of the number and percentage of women professional and subprofessional environmental health workers such as public health inspectors, water plant

ENVIRONMENTAL HEALTH

The Plan of Action is directed to improving and expanding drinking water supply and excreta disposal services, in accordance with the goal of the International Drinking Water Supply and Sanitation Decade. These services will be an important complement to the activities concerned with the control of diarrheal and preventable diseases and the improvement of nutrition.

Approach

The women in health and development component of the Plan calls for the maximum input of women in water supply and sanitation projects. Women are usually the ones who fetch and carry water for household use. They are also the main users and dispensers of water and the transmitters of wisdom and custom regarding personal hygiene. Project designers will have to listen closely to women and elicit their participation from the beginning if efforts to bring clean water and sanitation to rural and other underserved areas are to succeed. Sanitation projects often fail because many women lack an understanding of the purpose and the particulars involved in projects. The inclusion of women in the promotion, planning, and technical aspects of system operation will accelerate the acceptance of new interventions.

Areas of Action

- Prepare and test model environmental health education activities dealing with development and preservation of safe water supply, excreta disposal, and food sanitation.
- Develop and test model primary health care and rural sanitation projects that will work with available human and material resources, especially women's groups in the community.
- Establish rural and periurban training programs to prepare local women to participate actively in planning, implementing, and applying technology for water supply projects.
- Give women technical training in the operation, maintenance, and repair of water systems, in order that they can fully participate in the functioning of these systems.

Suggestions for Indicators

- Changes in orientation of water supply projects to include local participation, especially that of women.
 - Efficacy of educational activities in promoting interest and participation in water supply and sanitation projects.
 - Reduction in the incidence of environmentally caused morbidity.
 - Increase in the number of projects developed in which women participate actively.
-

operators, and sanitary engineers; and improvement of occupational health in industries traditionally staffed by women.

The Division of Environmental Health Protection is actively involved in implementation of the Plan. One of the projects proposed as part of this effort is preparation of a series of video-cassettes that would highlight the actual and potential roles of women in protecting the health of the environment and thereby of the community as a whole. To be entitled "Latin American and Caribbean Women in Environmental Health," the audiovisual series aims to educate society, and particularly women, on environmental health and their participation in its development. It is expected to be suitable for public viewing—e.g., for school and community groups in particular as well as for television audiences in general.

The contents of the five-part series will reflect: *the home environment*—environmental aspects of healthful housing design and proper home management and the role of women in food hygiene, nutrition, accident prevention, and solid waste management as well as in the health education of children in the home regarding hand-washing and the importance of general sanitation; *the working environment*—women's special environmental considerations and needs and the role of female marketplace vendors, waitresses, and schoolteachers, in promoting effective environmental health measures; *the community environment*—community education, participation, and management in urban and recreational areas, infrastructure, industrial operations, and women's contribution to an improved environment and better quality of life as consumers, purchasers, taxpayers, lawmakers, wives, mothers, and citizens; *environmental health career work*—women as public health inspectors, medical health officers, public health nurses, and health educators; and, finally, *women and the Water and Sanitation Decade*—sanitation and health, community education and organization, and planning and manpower development.

Women and Water¹

Many women in the world may spend as much as one-third of their workday locating and transporting water for drinking, agriculture, food production and preparation, and family hygiene. Achievement of the

¹Recommended reading on the subject is *Women, Water, and the Decade* prepared for the Water and Sanitation for Health (WASH) project of the USAID by Dr. Mary Elmendorf, 1981. Copies can be obtained by writing to WASH Project, 1611 N. Kent Street, Room 1002, Arlington, Virginia, 22209, USA.

health and nutrition goals of the Decade for Women depends on meeting such basic needs as daily access to an adequate and safe water supply. Success in establishing and maintaining water supply systems can be promoted by encouraging active community participation of women in designing, establishing, maintaining, and utilizing such supplies.

Realization of this connection between water supply and sanitation and women's well-being prompted the United Nations Conference on Women (Copenhagen, 1980) to pass a resolution which stated that the Conference:

1. *Strongly encourages* United Nations Member States and international organizations, including specialized agencies as well as nongovernmental organizations, to promote the objectives of the International Drinking Water Supply and Sanitation Decade;
2. *Urges* that United Nations Member States to commit funds and program development efforts to these objectives and to coordinate the program with other related sectors of development to make it more effective;
3. *Calls on* United Nations Member States and relevant United Nations agencies including specialized agencies to promote full participation of women in planning, implementation, and application of technology for water supply projects;
4. *Recommends* that the United Nations Development Program, as coordinator for the United Nations Water and Sanitation Decade, review in its annual report the progress in implementing the goals of this resolution, including in particular the extent of community participation by women and their involvement in designing, maintenance, and utilization of water supply.
5. *Urges* the World Health Organization to fully support the programs submitted by countries on drinking water supply and sanitation systems.

Proposals to involve women in water and sanitation projects were among the topics discussed at the ninth meeting of the Steering Committee for the Water and Sanitation Decade, held at the World Bank in Washington in April 1982. The Committee heard a report by the Organization on women as innovators in drinking water and sanitation projects, which stressed that the success of technical cooperation projects in developing countries depends to a significant extent on the role of women as active participants and beneficiaries of these projects.

An interagency consultation group convened by the Steering Committee concluded that since women are intimately involved in all aspects of village life, their participation in planning and provision of water and sanitation systems can help facilitate change, alleviate problems with acceptance at local levels, and mobilize support among village groups for new water and sanitation systems.

Four key roles of women in water have been indicated by Dr. M. Elmen-dorf (*op. cit.*): as acceptors of existing water services and sanitation customs, as users of new water and sanitation facilities, as managers of

household and community water resources and socializers in sanitary practices, and as change agents in breaking the fecal-oral route of infection through better use of water and sanitation facilities. She notes that: "Until women participate in project design and implementation, including user education and management of such facilities, limited acceptance and impact can be anticipated... One must look beyond technology to the roles and attitudes of the potential beneficiaries of new water and sanitation facilities, particularly the women, who are primary users of water and socializers of their children in matters of personal hygiene."

More research is needed to obtain relevant sociocultural data on the problems and constraints of women and more attention needs to be given to ensuring their participation in decision-making. Village women, whose roles make them the key to change, will not know how to break the fecal-oral route of infection—without which one cannot expect much improvement in health—until they have some important bits of additional equipment and understanding of how to use them. They need soap and hand basins, and adequate carrying and storage containers, along with conveniently located, nonodorous safe latrines.

Occupational Health of Women

The exposure of working women to organic solvents has become the subject of several project proposals being promoted by the Organization in relation to the Plan of Action for Women in Health and Development as it relates to environmental health protection. The goals of the effort include: definition of the magnitude of the problem; determination of the composition of the most commonly used products and their effects; establishment of appropriate techniques of evaluation, prevention, and control; and preparation of a manual on prevention and control techniques appropriate for use by small and medium-sized industries.

The development of safety codes and norms for industry, particularly those employing women, is an important activity that lends itself to incorporation into the Plan. Consequently, among the considerations being taken into account as part of the project are:

- What data are available on environmentally related morbidity rates?
- What is the number of existing and proposed community environmental protection projects such as safe water supply and excreta disposal systems?
- What is the number of existing and proposed water supply projects that include local participation?
- What research has been conducted on industries employing women workers? Have

OCCUPATIONAL HEALTH

The Plan of Action considers the provision of health care to the working population both important and relevant to the goal of health for all. In the past, occupational health problems have been viewed from the point of view of men's physiology. As more and more women enter the workplace, however, consideration will have to be given to their special needs.

Approach

The most important question to be asked regarding women's employment is whether there are occupations which are a hazard to women exclusively. One difference may be found in the fact that women who are new to the work environment are often unfamiliar with the machinery, tools, and equipment in use there—a fact which may result in a greater number of occupational accidents among women. Comparatively little is known about the occupational risks facing working women and the toll that those risks take on economic productivity—due in part to a general unawareness of the important contribution that women workers make to national prosperity. Many of the same occupational hazards exist for both men and women, but women's need to protect their unborn children poses additional complications. Women working in industry and agriculture face the hazards of exposure to toxic substances; pesticides, for instance, are known to result in birth defects and genetic mutations. Without an adequate data base, it is difficult to assess the full extent to which women are at risk.

Areas of Action

- Conduct research on industries employing women workers: tasks assigned, risks to women's health, occupation-related health problems and accidents, and effective preventive and curative measures.
- Develop preventive occupational health programs based on research results.

Suggestions for Indicators

- An increase in sex-specific data produced by industry, agriculture, and government in the countries.
 - The institution of female-centered concerns and measures in occupational health programs.
-

resulting data been used for the development of occupational health programs related particularly to women?

- What data are available on occupation-related morbidity patterns?
- How many preventive occupational health programs particularly related to women have been developed?

At the initiation of interest in this proposal, CEPIS was responsible for the occupational health program and therefore sent an original draft of the proposal to PAHO Offices in several countries to ascertain national interest. ECO has since become the focal point for occupational health, and, this project is thus included in its program of work. The Center is developing the necessary material to promote and facilitate preparation of the respective research proposals for utilization by the countries. Attempts are being made to secure extrabudgetary funding from international and bilateral agencies for support of the project. Two of the projects under review are described below:

In *Ecuador* there are a number of industries that use a high percentage of women workers who may become exposed to environmental toxins. These include dry cleaning, shoe, leather, cork, plastic, toy and textile industries. Many of these are small or medium-sized establishments that lack knowledge or resources to determine on their own the problem of exposure. The possible effects of such work involve the globulin-producing cells, the liver, and kidneys; some of the toxins are proven carcinogens, mutagens, and teratogens. Depending on the type of solvent used, impact may be of the central and peripheral nervous system, the hematopoietic, cardiovascular, hepatic, epidermal, and other systems. A project proposal is being prepared for UNDP support on prevention and control of exposure of the working woman to organic solvents. The Government of Ecuador is interested in receiving support from the Voluntary Contributions Fund of the UN Women's Decade, with PAHO acting as executing agency and the Ecuadorean Social Security Agency as national counterpart. ECO will provide advisory services in the realization of this project, which is expected to cost US\$120,600. It is to be of a three-year duration, beginning in 1982 and should contribute to the improvement of the working woman's condition, protecting her and her offspring against potential risks involved in exposure to organic solvents. The project likewise would permit the Ecuadorean Social Security Institute to evaluate and control the damage to health of women who are exposed and contribute with their work to the development of the community and the country. Specific objectives are: to attain an understanding and evaluation of the magnitude of the problem of exposure of working women to solvents nationwide; to determine the toxic materials

and compounds to which they are exposed; to apply adequate techniques to the qualitative and quantitative analysis of working environments and their effects on working women's health. Eventually, the goal is to establish a permanent national program for the prevention and control of these environmental risks that can be put into effect, once the project is completed, by the Division of Work Hazards of the Ecuadorean Social Security Institute.

PAHO staff have been collaborating with the Ministry of Public Health of *Brazil* in the formulation of a research project similar to the Ecuadorean one, which likewise would be presented to the Voluntary Contributions Fund of the UN Women's Decade. Women working in industries that use large quantities of organic solvents is an important problem, because it compromises the health of women workers as well as that of their offspring. It is expected that this project would form part of a more general program, the objective of which is the creation of a center for the study of occupational cancer at the University of Campinas Department of Preventive and Social Medicine. It is considered that the study of exposure to benzene used in glues and dilutants of the shoe industry would be an appropriate area of study. That industry employs thousands of women workers, and—as many of these do their work at home—not only they but their children are exposed. The project, which is expected to last 18 months and begin in 1982, would study the form and intensity of the exposure and would permit the establishment of the necessary preventive measures. PAHO through ECO would act as executing agency. Specific objectives include: definition of the actual magnitude of the problem implied in women worker exposure to benzene in the shoe industry, establishment of the number of exposed women and the intensity of that exposure; determination of the frequency and gravity of the pathology provoked by benzene in these women; establishment of the glues, dilutants, and parts of the production process that give rise most frequently to benzene exposure; development of appropriate techniques for evaluation and control of the exposure and medical monitoring of exposed working women groups; proposal of measures for the improvement of health and safety conditions of women shoe industry workers; strengthening of the national program so that it can conduct permanent action in the field of study on working conditions of women.

Human Resource Development

Human resource development embraces a number of components including employment, supervision, continuing education and training, and occupational welfare. PAHO cooperates with environmental health technical programs in the countries to convert the concept into a practical reality.

One of the main environmental sectors in which manpower development should be stressed is water and sanitation. The International Drinking Water Supply and Sanitation Decade poses special challenges for the Region at the local, national, and hemispheric levels in terms of human resource development. The Decade implies provision of these services to some 150 million rural inhabitants and well over twice as many city dwellers. It will only succeed if a systematic, comprehensive approach is made to overcoming the current constraints to progress in the sector, including those that hinder human resource development. Isolated attempts will do little to remedy the manpower problem. A systematic approach will necessitate the concerted efforts of all those involved in supplying drinking water and sanitation.

The expectation is that literally hundreds of thousands of people will have to be trained in the water and sanitation field in Latin America and the Caribbean, if the goal of the Decade—"water for all"—is to become a reality. Moreover, each of those trainees will have to be motivated, educated, and trained to perform a number of tasks.

Although training has in the past often been limited to those working directly in the water sector, it will in the future have to be extended to the community at large and to the vocational and university classroom as well. Projects will need to assign high priority to the active participation of community members in both the making and implementing of decisions and the operation and maintenance of systems. Education through the formal academic system and training within organizations will have to be seen as complementary activities and utilized to their fullest potential in the countries.

A new approach is essential to planning the formation of a workforce for the sector—taking into account the factors of supply and demand in the field of environmental engineering. Poor planning in the past has resulted

in overcrowding in some occupations and shortages in others—particularly in the nonprofessional categories, and integrated planning by both the producers and users of human resources is now called for. The coordination of human resource development planning will have to be carried out at the local, national, subregional, and regional levels. Furthermore, those already working in the sector need to be exposed to continuous on-the-job training to improve their performance.

The full benefits of investments already made and the continuing realization of such benefits are dependent on systems lasting for their full operational life, functioning 24 hours a day, and being used by the ultimate consumers to best advantage. Many of the benefits are lost at present and will continue to be lost unless the trained manpower is available to ensure good operation and maintenance and to promote good utilization of the services offered.

The PAHO Regional Program

Motivational Activities

The Organization is expanding its manpower development activities to strengthen existing national and regional training institutions, including giving technical guidance in updating curricula. Primary responsibility for manpower development and training in the Americas rests with each of the countries. For its part, PAHO—in the interest of furthering national self-reliance—includes a training component in virtually every environmental health protection activity of technical cooperation to the countries. Cooperation—in the form of motivation, orientation, and advisory services—aims to be both continuous and systematized to create training delivery systems.

These efforts are represented by activities aimed at motivation of decision-makers and agents of change as well as at the dissemination of new concepts and approaches. Special attention is being given to motivating managers and other decision-makers to accept human resource development as one of the institutional functions within the agencies for water and sanitation. This concept, if accepted and properly put into practice will lead to better planning of human resource development, enhanced utilization of already existing human resources, and a greater collaboration between water and sanitation agencies and the formal educational system.

PAHO, in the interest of stimulating motivation, organized a regional symposium, “Human Resources for the International Drinking Water

Supply and Sanitation Decade, (1981-1990),” held in July in Panama City. It took place immediately prior to the XVIII Congress of the Inter-American Association of Sanitary and Environmental Engineering (AIDIS), the main theme of which was “Sanitary and Environmental Engineering and the Development of the Americas.” As part of its proceedings, the congress discussed and adopted resolutions on the recommendations of the symposium.

For its part, the symposium represents the latest effort in the field of human resources in a decades-long series of collaborative activities between the countries of the Region and PAHO. Specifically, it targets the development of people capable of manning programs aimed at providing drinking water and sanitation services to everyone by the end of this decade.

Participating in the symposium were national authorities in a position to influence policy-making, strategy design, and fund allocation that should result in the development of individuals trained in the water and sanitation sector. Their objective was presentation and discussion of human resource demand for the Decade and the various means that can be used to meet it.

Eighteen speakers from a wide representation of countries in the Region gave papers on training subjects, followed by workshops that deliberated the topics and prepared the corresponding recommendations. Among other areas, they focused in particular on water and sanitation institutions, the formal academic system, and community education and training.¹

Among the intended outgrowths of the regional symposium is the conduct of national and subregional activities in order to more effectively promote both national self-reliance in terms of an awareness and development of human resources and technical cooperation among developing countries.

Operational Activities

In the context of making human resource development an institutional function, PAHO and USAID are joining efforts to establish an international mechanism to train senior managers as human resource development officers for water and sanitation agencies.

The first regional workshop on the establishment of training delivery systems was held at CEPIS in July 1981, with participants from South and Central America as well as the Caribbean.

¹The proceedings of the symposium will be published in the PAHO journal *Educación médica y salud* in 1982 and will be available through the Distribution Unit, Pan American Health Organization, 525 Twenty-third St., N.W. Washington, D.C., 20037.

The Caribbean Basin Water Management Project, which is to establish a training delivery system among 10 Eastern Caribbean countries, was evaluated in its first phase. The second phase has already started, counting now with financial contributions from participating countries.

The subregional training project for Central America, Panama, and the Dominican Republic aims at the establishment of a permanent training delivery system. Similar systems are likely to be established in other subregions and in some countries.

Planning guides have been prepared in 1981, and others are being elaborated in 1982, to support with models and other tools the human resource planning exercise.

PAHO and AIDIS are jointly producing a regional directory of institutions and agencies involved in human resource development and instructional materials production. CEPIS is coordinating a regional survey of the supply and demand for horizontal cooperation, including that in the areas of education and training.

A search was initiated in 1981 for instructional materials already available, which could be distributed among the countries. Those materials were compiled and handed out at the XVIII AIDIS Congress. At the same time, promotion is underway of the local preparation of instructional materials and job aids suitable for local needs. Toward that end, the Caribbean Basin Water Management Project elaborated 15 manuals, 7 job aids, 3 guides, and 2 handbooks, which were in turn made available to other countries in the Region. CEPIS is involved in the production of a series of training modules. In Brazil, the National Housing Bank program for state sanitation agencies (PRODISEN) is cooperating with the Latin American Center for Technology in Health Education (CLATES) in the development of training modules for institutional development.

The training-of-trainers concept—whereby supervisors in instructional and communications skills apply stepped-up on-the-job techniques for the training of their subordinates—was more widely applied during 1981 and 1982 as a means of enhancing the multiplier effect of technical training. To that end, Headquarters and CEPIS staff concentrated on the training of trainers in technical subjects.

PAHO is also collaborating with the WHO Water and Sanitation Decade task force on human resource development in efforts to prepare a regional capability for the collection and dissemination of information; collaborate with the planning of country-level requirements; prepare and field-test guidelines to assist in the implementation of priority Decade activities in

human resource development; and organize regional and subregional seminars and workshops to facilitate exchange of experiences.

Special attention is being given by ECO to aspects of training in the area of workers' health and the safe handling of pesticides.

The regional educational program in food inspection is structuring new programs in order to create a greater impact of its activities through multiplier effects.

Activities Ongoing in the Countries

Some of the training activities in environmental health fields carried out in the countries are outlined below:

Argentina. PAHO assisted in activities related to the National Program for Training in Sanitary Engineering, including a course on basic rural sanitation in border areas, a national workshop in support of water supply and sanitation information related to the REPIDISCA program, and the annual Latin American course on urban sanitation.

Belize. One of the objectives of the national health program is the education of health workers and the community and the enlistment of their support in keeping a safe and healthy environment.

Bolivia. Arrangements were being made for two academic fellowships in sanitary engineering. Fifteen PAHO fellows attended courses as part of DTIAPA and the CEPIS program. An intensive three-month course was given for 36 district environmental technical staff. In-service training was provided to technical personnel of environmental agencies which gave them an expertise heretofore lacking in the country. Collaboration was provided to the National Action Committee for the International Drinking Water Supply and Sanitation Decade in assessing existing human resources and the demand for the Decade. Training in solid waste management is another cooperative activity.

Brazil. PAHO continued cooperating with CETESB and FEEMA in technical cooperation programs that include training. Other activities involve COMLURB, as focal point for training in solid waste; a training program for rural health personnel in water supply and sanitation; and preparation of a human resource development component for the BNH/PAHO (PRODISAN) project.

Chile. PAHO provided assistance to the country's program of sanitary engineering education, the main objectives of which were: strengthening of teaching and research activities through the development of laboratories;

revision of academic curricula and the holding of postgraduate courses and training; provision of equipment and materials for the water quality laboratories; and provision of publications on sanitary and environmental engineering in support of the Sanitary and Environmental Sciences Information and Reference Center. In addition, PAHO cooperated in the holding of four seminars and courses and in grants for local costs.

Colombia. Training of activities encompass water treatment plant evaluation, solid waste management, and water basin management.

Costa Rica. PAHO staff assisted in the conduct of activities aimed at increasing the knowledge and experience of environmental personnel in the country. These included the organization and development of training activities: a one-week workshop on environmental health attended by 38 professionals, a two-week workshop on solid wastes attended by 19 professionals, a one-week workshop on educational methodology in which 25 environmental inspectors took part, a two-week course on optimization of water networks attended by 15 engineers from AyA, a two-week course on water meters attended by 9 engineers, a three-week course on operation and maintenance of water treatment plants in which 25 engineers from different Latin American countries participated. In addition, 11 scholarships were awarded in different environmental health fields.

Dominican Republic. PAHO collaborated in the training and preparation of national environmental health personnel abroad through the awarding of fellowships.

Ecuador. PAHO is assisting IEOS in assessing human resource need for the Decade-oriented rural water and sanitation program.

El Salvador. The course for sanitation inspectors was held, for which manuals were prepared.

Haiti. The Organization is collaborating with the National Action Committee for the Decade in assessing existing human resources and future needs in urban and rural areas.

Honduras. PAHO assisted in in-service training of personnel, cooperating in some cases with graduate theses in civil engineering. Training was also supported through fellowships and courses in solid wastes and plant design.

Jamaica. Activities include training in water pollution control and swimming pool operation.

Mexico. Six of the country's universities are carrying out sanitary engineering education programs. The National Plan for Training in the Drinking Water and Sanitation Subsector continues under the promotion of SAHOP. PAHO gave information regarding the Decade to sanitary engineering postgraduate students at the National Autonomous University

of Mexico. Organizational staff also gave a course/seminar on fluoridation for officials in the Subsecretariat for Improvement of the Environment.

Panama. PAHO awarded a fellowship for a postgraduate course in sanitary and environmental engineering for training through a course on the evaluation of water treatment plants in ERIS. It also made possible the participation of staff from the Ministry and IDAAN in the Central American Sanitary Engineering Congress. A fellowship was also awarded for participation in the solid wastes workshop.

Paraguay. Cooperative efforts consisted of training, fellowships, and a course with CEPIS related to water treatment plant design as well as assessment of existing and needed human resources for the Decade and training in operation and maintenance of rural water systems.

Peru. Training centered on solid waste management and design of a national training delivery system for the water and sanitation sector.

Trinidad and Tobago. Target activities were training in water system operation and maintenance and leak detection and control.

Venezuela. Staff are cooperating with INOS in devising a strategy for institutional strengthening through the development of human resources.

Information Exchange

The Pan American Information and Documentation Network—REPIDISCA

The need for a better technical information service in the areas of environmental health for the Region of the Americas prompted establishment of the Pan American Information and Documentation Network on Sanitary Engineering and Environmental Sciences, known by its Spanish acronym REPIDISCA. Sponsored by PAHO through CEPIS, the network began operation in 1979 and focused on collaboration to a number of countries in forming national information centers. Response to the original idea has been very supportive: the International Development Research Center (IDRC) of Canada provided funds for a two-year (1977–1979) development study of the network and has continued to be supportive since then. The Inter-American Association of Sanitary and Environmental Engineering (AIDIS) as well as numerous national water supply and sanitation institutions have enthusiastically encouraged the implementation of REPIDISCA.

A regional survey of information sources and users carried out as part of the REPIDISCA design project showed that, while a small number of countries in the Region had well-developed and sophisticated facilities for information transfer, the majority lacked an infrastructure that was capable of taking advantage of the available literature. Moreover, there was not a single service or array of services outside the Region that effectively covered the existing literature and documentation, whether produced in Latin American and Caribbean countries or produced elsewhere about those countries. It was also found that, to judge by the experience of existing international information systems, the most reliable and probably the most cost-effective way of ensuring coverage of the literature of any country is to begin at the source and make each country responsible for identifying and reporting its own literature within a regional network.

REPIDISCA thus focused on setting up a decentralized system of cooperating centers located in national institutions or regional agencies. At the national level, the cooperating centers are responsible for collecting and inputting national documentation, as well as offering local services. At the regional level, CEPIS provides training for development and operation of

the national centers and consolidates national inputs in a computerized archive and produces REPINDEX. REPINDEX, one of the principal services of the Network, aims to keep specialists—researchers, administrators, professionals, technicians, and students—informed of technical documentation published in their area of interest. It allows them to search for documents needed to carry out their work and to make copies of them.

This approach puts into actual practice the concept of technical cooperation among developing countries (TCDC) in that local autonomy is encouraged, greater self-sufficiency in providing information services results, and duplicated efforts among countries are avoided. At the same time, the Network is linked to a global information system (POETRI) sponsored by WHO and the International Reference Center in The Hague.

To date, 13 National Cooperating Centers (NCC) in six Latin American countries are participating in the Network. They include: the Centro Argentino de Referencia en Ingeniería Sanitaria (CARIS) of the Instituto Nacional de Ciencia y Técnica Hídricas, in *Argentina*; the Companhia de Tecnologia de Saneamento Ambiental do Estado de São Paulo (CETESB), the Companhia Municipal de Limpeza Urbana de Rio de Janeiro (COMLURB), the Fundação Estadual de Engenharia do Meio Ambiente de Rio de Janeiro (FEEMA), the Companhia de Saneamento do Estado de Paraná (SANEPAR), and the Secretaria Especial do Meio Ambiente (SEMA) of the Ministerio do Interior, *Brazil*; the Instituto Nacional de Fomento Municipal (INSFOPAL) of the Ministerio de Salud Pública, *Colombia*; the Centro de Información y Referencia en Ingeniería Sanitaria y Ciencias del Ambiente (CIRISCA) of the Universidad de Chile, the Empresa Metropolitana de Obras Sanitarias de Santiago (EMOS), and the Servicio Nacional de Obras Sanitarias (SENDOS), *Chile*; the Instituto de Investigación Tecnológica Industrial y de Normas Técnicas (ITINTEC) and the Servicio de Abastecimiento de Agua Potable y Alcantarillado de Arequipa (SEDEPAR), *Peru*; and the Ministerio del Ambiente y de los Recursos Naturales Renovables of the Dirección de Investigación del Ambiente (MARNR-DIA), *Venezuela*.

Activities Ongoing in the Countries

With respect to direct technical cooperation for the implementation and development of REPIDISCA, collaboration was effected during 1981-1982 with the following member government institutions. *Argentina* was the site of two missions to collaborate with CARIS/INCYTH in the preparation and realization of the national POETRI/REPIDISCA workshop in support of in-

formation on water and sanitation (Buenos Aires, October 1981) and with the project for integrated use of the middle Paraná for the organization of its documentation center as a Cooperating Center in Argentina.

In *Brazil* discussions were held with the National Housing Bank (BNH) on the possibility of its acting as an NCC in the water and sewerage sector, as a complement to the subnetwork coordinated by SEMA in the area of environmental protection. Contacts were established with other Brazilian entities with a view to their acting as cooperating centers in the national information network.

Collaboration was provided in *Bolivia* for the selection of a temporary consultant to make a pre-feasibility study on a water information system and for the presentation of observations on the specialist's final report.

Two missions to *Colombia* centered on collaboration with CERBI/INSFOPAL in the organization and presentation of lectures in the National POETRI/REPIDISCA workshop in support of information on water and sanitation (Bogotá, September 1981), carried out with the participation of 24 professionals, and with the General Health Research Administration and Sanitation Administration of the Ministry of Health on a study of installation of their respective information centers, which will act as cooperating centers in the Colombian network.

In *Chile* there was cooperation with CIRISCA/CONICYT in the organization and presentation of lectures and the contribution of teaching materials for a workshop-seminar on information in sanitary engineering and environmental sciences, held in Santiago in June 1981, with representatives from 109 sector entities in attendance, and cooperation in the development of the 1981-82 CIRISCA work plan.

Two missions went to *Ecuador* for collaboration with CINIRISCA/IEOS for the presentation of lectures at the national POETRI/REPIDISCA workshop in support of information on water and sanitation, held in Quito in September 1981, with 92 participants in attendance.

A follow-up visit was made to *Jamaica* to the Environmental Control Division (ECD) of the Ministry of Health, on the signing of an agreement between that institution and WHO/IRC/POETRI for the taking of an inventory and the holding of a national workshop, as called for in Phase I of REPIDISCA/POETRI joint activities.

Cooperation was provided to *Paraguay*, specifically SENASA, on a feasibility study for the development of the Paraguayan Information Center on Environmental Problems (CIPAR) as an NCC in REPIDISCA in that country.

Collaboration in *Peru* was provided with the Area IV Office of PAHO and

SENAPA for a prior study to determine the information needs and existing resources of the sector agencies, and for the organization and presentation of lectures at the national POETRI/REPIDISCA workshop in support of information on water and sanitation, held in Lima, at CEPIS, from 9–11 December, with the participation of representatives from some 20 institutions.

During CEPIS consultant missions or visits of institution professionals to the Center, analysis was made of the possibilities for establishment and/or development of NCCs or CCs in agencies of Costa Rica (AyA), Cuba (MIN-SAP), Honduras (CMDIC), Mexico (SAHOP), and Venezuela (CIDIAT, DIA/MARNR, and INOS).

Other Collaboration

Activities of cooperation and/or coordination have been carried out with other international organisms and systems of information within the scope of REPIDISCA/POETRI. The program participated in the Interagency Regional Water Resources Committee meeting, sponsored by ECLA; the Meeting of the Interagency Working Group on Environmental Information, sponsored by UNEP/ROLA and held at CEPIS in September 1981; and the Interagency Meeting on Environmental Information Systems held with the same sponsorship at ECLA (Santiago de Chile, in December 1981), where concrete aspects of interagency cooperation in the field were discussed, and an analysis made of ways of making REPIDISCA data inputs compatible with those of ECLA, CLADES and CELADE systems.

In collaboration with WHO/IRC/POETRI, two revisions and a detailed commentary were made on the "Intermediate Thesaurus for Community Water Supply and Sanitation." UNESCO offered collaboration so that a Center official could participate in a two-week course on ISIS usage held at UNESCO headquarters in late 1981, and a preliminary agreement between PAHO and UNESCO was signed for the start-up in 1982 of a regional document delivery service project for the users of REPIDISCA.

At full operation of the system, REPIDISCA will have achieved—in keeping with the principles of TCDC—a regional information infrastructure at the service of environmental engineers and scientists, research workers, teachers, designers, managers, technicians, operators, and community developers working with water supply and public health agencies throughout the Caribbean and Latin America.

Information and Publication

During the past year information and publication activities conducted at CEPIS included: answering more than 500 requests for information, distributing more than 1,200 PAHO/WHO/CEPIS publications, and supplying more than 8,000 photocopies; publication of four issues of "Noticias sobre Ingeniería Sanitaria y Ciencias del Ambiente"; four issues of TAB-CONT/CEPIS (tables of contents of periodicals received at the Center); four issues of "Carta Periódica de DTIAPA"; four issues of "Hojas de Divulgación Técnica"; two issues of the "Noticiero de REPIDISCA"; and an experimental issue, number zero of "REPINDEX" (index of documents entered into the REPIDISCA data base). Issue number one of REPINDEX was published in early 1982, with more than 700 references contributed in great part by the NCCs of the network. REPINDEX thus absorbs the functions of the "Boletín Bibliográfico," which previously recorded the acquisitions of the library on a quarterly basis. The publication of the library catalogue, along with the document delivery service, will allow extensive use by the NCCs and national users of the valuable bibliographic material collected in the CEPIS library (25,000 titles) and the Network data base. In production by computer are the "Directorio de Instituciones de Agua y Saneamiento de América Latina y el Caribe", and the "Catálogo de Obras de la Biblioteca del CEPIS".

The technical series is reprinting, in response to numerous requests, "Teoría, Diseño y Control de los Procesos de Clarificación del Agua". Printing has also begun of the Spanish and English versions of the document "Modular Water Treatment Plants". The REDPANAIRE Final Report was published, as were the Final Report on the Workshop on Programs in Occupational Health and the technical document on "Avances en el Tratamiento de Aguas Residuales por Lagunas de Estabilización" and "El Control de las Pérdidas de Agua en los Sistemas de Abastecimiento de Agua Potable". Also printed were the thesaurus of REPIDISCA (MISCA) and the MISCA Users' Manual as well as 12 modules for the Regional Course for Trainers in Water and Sanitation Information. Other publications include: in the series miscellaneous documents, more than 80 new modules and submodules of the principal learning cycles, plus 120 reprints of course lectures, three pamphlets on CEPIS' training activities, two editions of the publications catalogue, and numerous course documents.

During 1981-1982, the program of translations of technical literature has also expanded. Cooperation of Center staff with Ricardo Palma and Femenina del Sagrado Corazón Universities of Lima made it possible to in-

crease the number of technical documents in English and other languages being translated into Spanish. Several translations have thus been completed: "Guide to Simple Sanitary Measures for Control of Enteric Diseases" (Geneva, WHO, 1974); "Analyzing and Interpreting Air Monitoring Data" (WHO offset document No. 51), and selected articles from "Low-cost Technology Options for Sanitation" (Ottawa, IDRC, 1978). Rights have been acquired for the publication of the Spanish edition of "Evaluation for Village Water Supply Planning," IRC Technical Paper Series No. 15 (London, John Wiley, 1980). These documents will all be printed in 1982. Translation has also begun of selected chapters of the "Design Manual: Onsite Wastewater Treatment and Disposal Systems" (U.S. Environmental Protection Agency, 1980); "Management of Solid Wastes in Developing Countries" (New Delhi: WHO, 1976), and "GEMS/Water Operational Guide". Arrangements are pending for authorization, rights and/or financing of the translation of three other texts. Several articles have been translated and are ready for editing, after which they will be published as "Hojas de Divulgación Técnica". Three other documents are in progress, for use in CEPIS courses and for possible publication as technical documents.¹

¹Documents and publications mentioned here may be obtained by writing directly to the Pan American Center for Sanitary Engineering and Environmental Sciences/CEPIS, Casilla 4337, Calle Los Pinos 259, Urb. Camacho, Lima 100, Peru.

Research

Throughout the Americas governments have become increasingly more conscious of the significance, relevance, and necessity of scientific and technologic advances—the products of research—in solving current practical problems related to environmental health. This growing consciousness stems from a recognition that, on the one hand, the environment is a major factor in basic health problems in that it contributes to so much disease; and, on the other, the environment is the key to the most effective preventive and control measures to combat many diseases. Consequently, much more research needs to be carried out in this area.

Research in environmental health should aim at providing a variety of technological and management solutions to cope with complex environmental problems. As discussed at length elsewhere in this publication, the basic sanitation concerns continue to prevail in many urban and rural areas. Air and water quality have deteriorated to levels that endanger human health. Improper handling and disposal of solid wastes lead to the proliferation of disease vectors. Noise and congestion increasingly affront urban dwellers, while injuries and occupational diseases due to hazardous environmental conditions are common. Environmental protection technologies and programs must be researched in greater depth to respond to these worsening conditions.

The control of environmental hazards depends on the scientific understanding of their adverse effects on health; on adequate warning and monitoring systems; on realistic evaluations of the health, social, and economic benefits and risks for individuals and the community, as well as on other related factors. These basic elements are, by and large, not available in developing countries and constitute appropriate subjects for research. Investigations in these areas are, however, extremely complex, time-consuming, expensive, and require multidisciplinary expertise. Fortunately, a great deal of research has already been done on those subjects in industrialized countries, and developing ones can benefit from their results. In the field of environmental health research, hundreds of millions of dollars are spent annually in North America, Europe, and Asia. The benefits that may be accrued will depend on the countries' capacity to per-

mit judicious evaluation, adaptation, and complementation through research, in the light of the specific needs and conditions.

Types of applied research considered to be of high priority to provide solutions to the most important environmental health problems include:

- Projects aimed at providing a better understanding of the actual magnitude of environmental health problems;
- Research and development of technologies incorporating inexpensive, appropriate design methods, construction, operation, and maintenance;
- Development of adequate sampling and analytical techniques;
- Control strategies appropriate to conditions in developing countries;
- Interdisciplinary and multi-institutional research in related environmental science and engineering fields.

PAHO Efforts in Support of Research

In consonance with the growing consciousness among countries of the Region of the importance of research in environmental health, the Organization promotes national research efforts through the furtherance and funding of environmental investigations, the backing of a number of independent researchers and teams, and the support to the countries from staff in the Division of Environmental Health Protection, including those working at Headquarters and in the Pan American Centers for Sanitary Engineering and Environmental Sciences and for Human Ecology and Health.

There is continued emphasis on identifying national and regional collaborating institutions to complement the research and investigations being conducted at universities. The Organization has been instrumental in directing grants and loans from international agencies to establish a number of institutions that are now functioning effectively in developing appropriate technology to solve national and regional environmental health problems. Many of these institutions are now in operation; others are in various stages of development. These efforts to strengthen national entities are in keeping with the wishes of the PAHO member countries themselves, in furthering the concept of technical cooperation among developing countries (TCDC).

In general terms, PAHO believes that national policies should foster research through a concerted campaign that combines several approaches: the establishment of research centers; the determination as well as the acquisition of the resources necessary to pursue investigations; the collection of data on national scientific efforts, e.g., who is working in the field, what

facilities and funds are available, and what the training and equipment needs are; and promotion of an awareness of the need to designate a percentage of national budgets to research. In support of these approaches PAHO assists in:

- Outlining areas of research need,
- Identifying sources of technical financial assistance,
- Providing mechanisms for improving communication, and
- Undertaking inventory of resources—finances, facilities, personnel.

In specific terms, the Organization provides technical cooperation in research activities regarding water supply and sanitation, solid waste management, environmental pollution, occupational health, and food protection. CEPIS concentrates primarily on research related to improving drinking water quality; appropriate technology for water supply and sanitation in rural and urban slum areas; institutional development of urban and rural water authorities; extension of water services to slum areas through improved commercial systems and water-loss reduction programs; collection, transport, and disposal of solid wastes; and control of environmental pollution and hazardous substances. Auxiliary activities include training and information exchange through the Pan American Information and Documentation Network on Sanitary Engineering and Environmental Sciences (REPIDISCA).

Research activities at ECO concentrate on environmental impact assessment, environmental health criteria and standards, chemical safety, occupational health; environmental monitoring and surveillance, and information exchange.

Research at the National Level: Ongoing Activities and Limitations

Research related to water or other components of the physical environment is being carried out at many institutions throughout the hemisphere, principal among which are: the Companhia de Tecnologia de Saneamento Básico (CETESB), São Paulo, Brazil; the Centro de Investigaciones y Entrenamiento para el Control de la Calidad del Agua (CIECCA), Mexico, D.F., Mexico; the Fundação Estadual de Engenharia do Meio Ambiente (FEEMA), in Rio de Janeiro, Brazil; the División de Investigaciones sobre el Ambiente (DIA), in Caracas, Venezuela; the Instituto Nacional de Ciencia y Técnica Hídricas (INCYTH), Buenos Aires, Argentina; the Subsecretaría de Mejoramiento del Ambiente (SMA), Mexico; the Escola Nacional de Saúde Pública, Rio de Janeiro, Brazil—among many others.

In the field of occupational health, research is carried out at the Instituto

Nacional de Tecnología Industrial, in Buenos Aires, the Facultad de Ingeniería Química of the Universidad Nacional del Litoral in Santa Fé, Argentina; the Faculdade de Saúde Pública of São Paulo University, and the Fundação Centro Nacional de Segurança, Higiene e Medicina do Trabalho (FUNDACENTRO) in São Paulo; Departamento de Salud Ocupacional y Contaminación Atmosférica of the Servicio Nacional de Salud in Santiago, Chile; the Secretaría del Trabajo y Previsión Social in Mexico, D.F.; the Instituto Centroamericano de Investigación y Tecnología Industrial (ICAITI), in Guatemala, and with lesser intensity in institutions of other countries.

Research and investigation on solid waste management in the countries are limited, despite the importance of the problem. Some work is being done on recovery of waste heat and recycling of wastes at the Companhia Municipal de Limpeza Urbana (COMLURB) in Rio de Janeiro, but otherwise the research needs in this respect are great.

The ecological approach to disease prevention and control is becoming more prevalent. Several universities are initiating action. The Gorgas' Memorial Institute of Tropical and Preventive Medicine, in Panama, is one of the laboratories involved in research in this area.

Among the obstacles that impede the progress of research in the environmental health field in Latin America and the Caribbean are the lack of policies favorable to science, of a basic infrastructure, of funds, as well as a scarcity of adequately prepared and motivated scientific investigators and of an atmosphere conducive to research and creativity.

Some research is carried out at universities for the preparation of theses, and operations research is performed by service institutions such as water supply authorities, but results are not always applied because of the lack of mechanisms for translation of results into practical, useful forms. Further, there is a lack of scientific journals for the publication of research results and means to disseminate them widely to researchers and decision-makers. With some exceptions, the level of research conducted does not contribute sufficiently and effectively to the solution of country problems.

Data collection, retrieval, and distribution capabilities are still limited, and facilities for data management are in general scarce. Country-wide environmental monitoring systems are incipient. Some efforts have been made to promote them through the Global Environmental Monitoring System (GEMS) in the areas of air, water, food and biological monitoring; however, they are still in the initial stages of development. Exceptionally, in some cities like São Paulo and Mexico, there are advanced air monitoring networks.

At the national level, to assure that research activities are successfully implemented, a series of questions should be asked prior to the setting of policy. How can research provide the necessary appropriate technology for the environmental health sector and systems to generate a decisive impact? How can it contribute to development of the national operational capacity? What are the implications for the governments in respect of the resources, organization, and orientation of research in the environmental sector? To answer these and similar questions, information is required as to the people, centers, and other institutions working in the field, the activities ongoing, the prevailing constraints, and numerous other related factors. To date, such information is available only in a small part.

In the environmental as well as other health fields, the ultimate aim of an infrastructure for research is the support of processes that increase the accessibility and efficiency of services. There is a complementarity between basic and applied research, and both are important. Whereas basic research is often preferred, applied research is essential to immediate action and to the development of appropriate technologies.

Several Latin American countries have established postgraduate training programs for sanitary engineers, but few have training programs for environmental scientists. The training of professionals does not always include research work either of a theoretical or practical nature except at the postgraduate level. The training of environmental engineers and environmental scientists seems to be decreasing in some countries and there are very few interested in or devoted to research. One important observation is that many researchers come from those that have been trained abroad and exposed to research activities. The role of the universities in the development of human resources for research, so that teams of qualified professionals can tackle research problems in the critical areas of need, should be strengthened.

Lack of financial aid is one of the major stumbling blocks to the progress of research in the environmental field. Funds for salaries, equipment, and supplies are often inadequate—making it difficult for laboratories to develop and for organized research to get underway. Laboratories are equipped and staffed at minimal levels and, therefore, may respond only to critical situations. Mechanisms for financing scientific investigations that are not subject to excessive bureaucratic control exist in some Latin American countries. It may be desirable to study the possibility of establishing autonomous foundations to finance scientific investigations and to provide fellowships and grants to facilitate the preparation of adequate human resources for research in environmental health. Because of

underfunding, trained people and facilities are underutilized in almost every country in Latin America and the Caribbean.

Prospects for the Future

There is cause for optimism about the research potential in Latin America and the Caribbean in the environmental health field. Firstly, health policies emphasize the importance of research, as detailed in the Regional Plan of Action for Health for All. Further, limited inventories carried out in some countries reveal that a significant amount of research is being conducted and that excellent research facilities can be found in a few countries.

Foci of basic research have emerged largely as a result of the dedication, competence, and capacity of individual investigators. Promotion of their association with researchers in other fields, as well as with engineers, economists, administrators, sociologists, and other professionals could stimulate their imagination to tackle more practical problems.

An important step may be to demonstrate the capacity of the university structure for applied investigative work and for training of researchers at higher levels. With steady support and within a coordinated research program, universities could serve as the most important research vehicle for government agencies responsible for providing environmental services.

Technological institutions likewise represent an important component of the research infrastructure for environmental health. Their participation in evaluation of existing technologies or development of appropriate ones can bring large dividends.

In the development of national policies, regional and global efforts for international cooperation should be taken into consideration. Information systems are developing in the Region. The availability of technical and scientific information to countries, institutions, and researchers can be facilitated through REPIDISCA (for more, see page 128), the emerging information system of the Pan American Center for Human Ecology and Health, and the Regional Library of Medicine and the Health Sciences (BIREME), in São Paulo, Brazil, with access to data banks in North America and Europe.

The ultimate aim of research, like that of all other health care strategies—training, information exchange, community participation, technical cooperation, etc.—is the attainment of universal well-being. To realize that goal, national health research policies should respond to prevailing conditions and needs. One of the most salient of these is the

urgency of attention to the environment—in all its ramifications—as a major factor in human health.

As a means to attain health for all by the end of this century, the pursuit of research will require external support. The flow of additional resources should be channeled towards the needs identified by each government, so that international cooperation complements national effort. International cooperation must therefore be carefully programmed and coordinated if a maximum impact is to be obtained, costly duplication avoided, and coordinated action ensured. The Pan American Health Organization is applying its resources to the realization of such cooperation.

Disaster Preparedness and Emergency Relief

TECHNOLOGICAL DISASTERS¹

Societies have historically recognized natural hazards—such as earthquakes, hurricanes, floods, and droughts—as potential disasters that can be the cause of much damage to the health and well-being of individuals and even entire countries. They have given considerably less attention, however, to man-made or technological disasters. Such disasters may be on the rise in the Americas, nevertheless, as population density and industrialization continue their vertiginous growth, without adequate safety planning.

Technological disasters include explosions, aircraft accidents, major fires, massive and sudden chemical contamination, industrial accidents involving the surrounding population, and the collapse of dams, stadiums, and other structures.

A technological disaster or emergency may occur in isolation or as the consequence of a natural disaster. If, for instance, a chemical plant or storage facility is damaged by an earthquake, it may cause sudden and massive contamination of nearby water, air, and land. National disaster preparedness planning should not overlook such a contingency, and countries will increasingly have to consider major accidents as an area of potential emergency activities.

The World Health Organization has recognized the growing importance of technological disasters as a public health concern, and its Regional Office for Europe has undertaken a study on emergency response to chemical accidents, as part of the International Program on Chemical Safety (IPCS). In the Americas, the Directing Council of PAHO adopted a resolution in 1980 requesting the Organization to “assist Member Countries’ health sectors in the development of disaster preparedness programs ... in the case of natural or technological disasters of public health importance.”

¹The text that follows has been adapted from “Disaster Preparedness in the Americas”, a newsletter of the Pan American Health Organization, Issue No. 11 (April 1982).

Chemical Emergencies

The IPCS study on health aspects of chemical safety has indicated that toxic and potentially toxic chemicals are now a part of the daily life of most people in the world. Because of the ever-increasing volume of chemicals that are being extracted, manufactured, transported, stored, used, or disposed of as wastes, it is inevitable that accidents will happen with increased frequency all over the world. This adds a requirement for information and expertise that most emergency response systems are not prepared for.

Preparation for dealing with technological disasters, particularly those related to chemical contamination, is an extremely difficult exercise that can involve great expense. Spillages resulting from transportation accidents, for example, often take place in areas that are remote from large urban centers in which the best facilities for handling the problem exist.

To add to the complexity, there are thousands of different toxic chemicals, each with its own properties and risks for emergency crews and the population at large. Containment and decontamination procedures vary greatly, and speedy access to the relevant information in itself presents problems. This is true even when all of it exists in a central location, established expressly for that purpose. And such organization is more often the exception than the rule.

Even in many of the most industrialized countries, the health and other sectors generally lack the type of information, planning, and trained personnel needed to respond promptly and adequately to this type of emergency. A recent study² in the United States, for example, showed that at the individual community level, "With regard to overall preparedness for technological disasters generally, which includes sudden chemical disasters, there seldom is one organization which assumes the responsibility. . . . In the overwhelming majority of American communities there is neither one organization nor a collection of organizations which could or can provide a good and complete chemical risk assessment of the area. . . . Very few locally based groups have the specialized personnel, relevant information, or special equipment required for fighting chemical hazards, or even the knowledge of where such resources could be located and obtained." If this is the case in a highly developed country, in one that is developing it is much more serious.

²Quarantelli, E.L. and Tierney, K., *A Model for Studying Community Preparedness for Acute Chemical Disasters*.

The Importance of Information

When an emergency situation is compounded by a total lack of information or by misinformation, a potentially minor accident may have truly disastrous effects. Alternatively, a large population may be subjected to inconvenience through unnecessary precautionary evacuation. Following the accidental release of TCDD (tetrachlorodibenzopara-dioxin, a highly toxic chemical thought to be teratogenic) from a chemical plant at Séveso, Italy, in 1976, lack of information on the real danger imposed by the substance led to a nine-day delay before evacuation procedures were instituted. On the other hand, after the derailment of a freight train carrying chlorine in Mississauga, Canada, a large proportion of the 250,000 persons who were evacuated need not have been, according to some researchers.

PAHO Information Center

Information related to chemicals, toxicology, equipment, and other matters concerning technological disasters is a critical component in any emergency preparedness plan. Equally critical is its organization for quick retrieval. The majority of the countries of the Americas cannot afford to maintain such comprehensive information and data systems on an individual national basis, and, at any rate, would be hesitant to do so given the relative infrequency of technological disasters to date. By sharing resources through networks of collaborating centers and institutions, however, they can enhance their capability to deal with potential emergencies even before they occur.

In collaboration with the PAHO disaster preparedness and emergency relief coordination program for the Americas, the Pan American Center for Human Ecology and Health (ECO) is initiating a project to gather and disseminate information on the subject, with special attention to potential disasters caused by sudden chemical contamination of the environment. As a first step in this direction, the program will concentrate on the identification of existing organized sources of relevant information on technological disasters, and their public health aspects, with a view to organizing an informal cooperative network. This work aims toward the eventual preparation of an "Information Source Index" on information services and centers, for distribution to the health sectors of the countries of the Region.³

³Any institution or organization wishing to obtain more information or which would be willing to cooperate in the proposed information network should write to the Pan American Center for Human Ecology and Health/ECO, Apartado Postal 37-473, Mexico 6, D.F., Mexico.

Public Awareness for Disaster Preparedness

The importance of public awareness and precautionary measures to deal with disasters was the main topic of discussion at a meeting of the Pan Caribbean Disaster Preparedness Team in Antigua in February 1982.

Representatives from the disaster preparedness offices of Jamaica, Barbados, and Dominica met with staff from PAHO, the U.N. Disaster Relief Organization, the League of Red Cross Societies, the British Red Cross, and the Organization of American States.

It was pointed out that while earthquakes, volcanic eruptions, and floods all occur in the area, the natural disaster most prominent in people's minds is the hurricane. But survey evidence indicates that the population at risk is generally unaware of basic precautionary measures that could safeguard lives, health, and property.

The group agreed that the sharing of printed and visual information materials on a regional basis would avoid duplication of effort, and that collaboration was necessary among the health, agriculture, planning, public information, transport, education, and other sectors.

Caribbean Activities

The Environment and Public Health in the Wider Caribbean

Despite the image of earthly paradise that the Caribbean evokes, life in the area poses serious social and economic problems. In the countries of the Caribbean, health conditions, particularly those arising from environmental factors, reflect the level of national socioeconomic development. In almost every country, diseases linked to unsanitary conditions figure among the major leading causes of death.

The importance of these conditions cannot, therefore, be overstated and have been the subject of an article by Engineer Raymond Reid, of the Division of Environmental Health Protection/PAHO, that appeared recently in *AMBIO*. Some of the highlights of that article are presented in the paragraphs that follow.¹

The large disparities in wealth, size, and culture of the countries of the Caribbean make comparisons among them somewhat difficult. Per capita gross national product varies by a factor of more than 10 between the poorest and the richest countries. Another significant contrast derives from their differences in size: Mexico City, with its reported 14 million inhabitants, is one thousand times more populous than the island of Montserrat. Important environmental considerations also present variations: some islands, like the Turks and Caicos, have very limited water resources due to low rainfall; others are covered with flourishing tropical forests.

Various geopolitical groupings—the Caribbean Community (CARICOM) and the Conferences of Central America and Panama and the Andean Pact countries—have been established as forums to discuss common cultural, social, and economic attributes as well as to join forces in overcoming common difficulties. Most of the smaller territories in CARICOM, for instance, are facing similar economic problems, partly because of their size and the

¹The original article appeared in *AMBIO*, Vol. 10, No. 4, 1981. The term “wider Caribbean” is used to include all those countries and islands whose shores meet the Caribbean basin. For further information, the reader can write directly to *AMBIO*, Royal Swedish Academy of Sciences, Box 50005, S-104 05 Stockholm, Sweden.

lack of a coordinated economic development strategy for the area as a whole.

Health is an important consideration throughout the Caribbean, and great emphasis is placed on such environmental services as water supply, sewerage, and solid waste management. There is also a growing awareness of the importance of pollution control and occupational health. The Conference of Ministers Responsible for Health in the Caribbean has indicated that the greatest hazard to human health in the Caribbean is related to environmental factors.

The article goes on to describe the disease profile of the area, particularly those conditions related to environmental health such as diarrheal diseases and typhoid fever, malaria, schistosomiasis, infectious hepatitis, dengue and yellow fever.

In regard to water supplies, considerable progress has been made through the efforts of a number of parties, most importantly the countries themselves. Today most of them have an active, ongoing water improvement program.

The major thrust of the water program aims to provide adequate urban water supplies, but considerable attention also focuses on small towns and rural communities. Various programs have been designed to help the governments define national and local policies, integrate water supply in the economic development plan, develop master plans for water supply service, finance studies and construction of facilities, streamline water supply management, and develop human resources. Financing, managing rural water supplies, and ensuring that these areas obtain an adequate supply of water still represent major tasks for the 1980s.

Urban sewage services have failed to keep up with the gains made in water supply and quality. The available data indicate that none of the countries have as yet made any significant progress in the field. In fact, half of them report servicing less than 35 per cent of their urban population. Few sewage services exist outside urban areas. The sewage situation appears more critical in the insular Caribbean, where 60 per cent of the islands reported little or no services at all. The percentage of population connected to sewage systems on the whole remained static in the past decade, which means that the increase in connections is barely keeping pace with population growth. There has been less funding available for sewage services than for water supplies.

Urban areas have been allowed to develop subdivision by subdivision, in most cases without any integrated planning for sewage services. This has resulted in large numbers of septic tanks and cesspools in concentrated ur-

ban areas, even though the population density warrants central collection and disposal. These facilities tie up capital—through individual owner investments—which might equal the cost of a central system, but which do not now result in a final solution to the problem of waste disposal in the inner cities. In countries like Jamaica, where regulations require the provision of sewage systems for urban subdivisions, this fragmented approach results in a number of small systems and sewage treatment plants discharging into drainage channels, with little hope of those systems being integrated in a comprehensive manner. In most urban areas the core sewage system is extremely old and overloaded. Considerable improvement and expansion are needed. These systems generally discharge raw or inadequately treated sewage directly into harbors or on beaches. Less than 10 per cent of the sewage produced in the Caribbean is treated.

Greater community involvement may be the key to mobilization of resources for improving facilities in rural areas. In addition, health education programs seem to be badly lacking in existing rural sanitation programs, since underutilization and non-use of sanitary facilities have been reported in many instances.

Although detailed and comprehensive information is not available on a regional basis, the analysis of existing data shows that the management of solid wastes lags behind all other public services. Studies in several countries confirmed that service administration is generally deficient, collection and disposal unsatisfactory, and most personnel untrained.

Furthermore, solid waste institutions are not usually well equipped to perform the operating functions of collection and disposal. Generally no fees are collected, and only recently have external credit agencies shown limited interest in financing equipment for solid waste operations. The effort and funds required to do so are considerable.

In the Caribbean, the process of industrialization is taking place without a corresponding improvement of the work environment. In each of the countries, there exist institutions in charge of protection of the working environment, but unfortunately the information collected by these agencies is not widely disseminated and the available data in this field are not sufficient to define adequately the magnitude of the problem.

The frequency of accidents and their gravity (as expressed by the number of work days lost per million man-hours of work) are reported to be high for most countries. In regard to occupational diseases statistics are more difficult to obtain. Their symptoms can be easily confused with those of other diseases, particularly in the absence of specialized medical personnel and appropriate laboratories and diagnostic facilities.

Environmental contamination from industrial and urban activities is becoming an important problem in the Caribbean, one that contributes to the pollution of air, water, soil, and food resources and which may affect human health. Until now the construction of treatment facilities and of other means to combat water pollution has been minimal. Air pollution is increasing in the large metropolitan areas, while control programs have not kept pace. The increasing use of chemical products, including pesticides and herbicides, to augment agricultural production contributes to soil pollution and sometimes to water and air pollution. As a consequence of growing industrialization, it can be expected that pollution problems will increase considerably in the years to come if early measures for their control are not accelerated.

Pollution of beaches in the small islands of the Caribbean by oil from ships is a major problem that may adversely affect tourism. Raw sewage discharge from hotels and solid waste from resorts are also causing localized pollution.

The risks produced by environmental factors have to be evaluated in relation to their health, social, and economic consequences, and the present and future exploitation of environmental resources. Of primary importance are the risks to health produced by pathogenic and toxic agents. Epidemiological surveillance, evaluation of pollution, and environmental resources management require complex methodologies, equipment, and human resources for which international cooperation is needed.

The institution of basic sanitary measures will continue to be the main priority for technical cooperation of the Organization with emphasis on project preparation, water quality control, operation and maintenance, and rural sanitation. Continuous support will be given to those projects identified as priority areas by the governments of the Caribbean through CEPIS, ECO, and the Caribbean Epidemiology Center.

Action Plan for Environmental Management in the Wider Caribbean

In the context of environmental health conditions outlined in the foregoing paragraphs, the countries of the Caribbean, acting in concert, have launched a far-reaching environmental protection plan that ranges from combating oil spills, managing watersheds, and protecting coral reefs, mangroves, tropical forests and endangered species to mitigating the risks of natural disasters, monitoring coastal water pollution, and studying the

impact of tourism on the environment. The plan was adopted by representatives of 23 of the 27 Caribbean states, territories, and islands at a meeting held in Montego Bay, Jamaica (April 1981).

In preparation for final adoption of the plan, a number of interagency meetings were held in which PAHO staff took an active part—including advisory services in the elaboration of meeting documents, participation in meeting discussions, and preparation of an overview of the environmental health situation and the corresponding regional needs. In addition PAHO staff, including those at CEPIS and ECO, and several WHO Collaborating Centers are participating in execution of the plan's objective.

To finance the plan an initial sum of \$8.2 million is to be raised over a period of three years, 1981-1983. Cabinet Ministers and high government officials pledged to raise US\$1.5 million for a Caribbean Trust Fund of which \$1.2 million was committed at the Montego Bay meeting. Country contributions will range from \$375,000 from France, \$250,000 from Mexico, and \$230,000 from Venezuela to about \$30,000 each from Colombia and Cuba, and around \$16,500 each from Barbados, Dominica, Nicaragua, and several other countries.

UNEP, which jointly sponsored the conference that adopted the plan with the United Nations Economic Commission for Latin America, promised to contribute \$1.38 million provided the Caribbean countries fulfilled their promise to put \$1.5 million into a trust fund. The remainder of somewhat over \$5 million will come from governments and development aid organizations.

Other concrete decisions were the choice of Jamaica as the headquarters of the small Caribbean Action Plan Coordinating Unit; the naming of a nine-country monitoring committee (Colombia, Costa Rica, Cuba, Dominican Republic, France, Grenada, Mexico, Saint Lucia, and Venezuela) which will work with UNEP in carrying out the action plan; and agreement to go ahead with the drafting of a Caribbean environmental treaty, to be ready—if possible—for signing early in 1983.

The projects identified as having the highest priority must be described in detail and circulated to all the countries participating in the action plan. The countries must then decide which projects they wish to participate in, which of their national institutions are available for participation, and the level and kind of contributions they can offer to specific projects.

Project descriptions will likewise be sent to potential funding agencies such as the World Bank, the UNDP, and the Canadian International Development Agency (CIDA).

PAHO to Execute Subregional Environmental Health Project

The Organization is providing full support to implementation of the above-mentioned action plan. PAHO will be acting as executing agency for a two-year subregional project—to start in early 1982—related to the action plan, for the purpose of development and strengthening of national capability for improving environmental health services—including drinking water supplies in urban and rural areas, water quality control, water resources, sanitary waste disposal, water pollution control, and vector control.

It is expected that the activities of this project will make a considerable contribution to achievement of the goals of the Water and Sanitation Decade and the targets of the Caribbean environmental health strategy, i.e. the development of programs with realistic standards to provide water supplies and sanitation services for all urban and rural areas by 1990. It will also strengthen institutional capability of national institutions to deal with problems related to environmental health—occupational health, control of toxic materials, food sanitation, and solid waste management.

The project is designed to stimulate coordinated planning and program development in environmental health as a step toward improving the public health and socioeconomic standards of the countries. It will endeavor to: provide a means of coordination for existing resources so that all countries can receive maximum benefits; develop models and norms that can be applied on a regional or subregional basis to support country-based programs; provide a vehicle for technical cooperation among the countries of the subregion; and develop project proposals for solving specific problems for consideration by international or bilateral financing agencies.

An important aspect of the project is the integration and coordination of other regional or subregional environmental project activities to optimize resources and provide an integrated approach to their development and avoid competition for scarce resources. Direct linkage will be established with existing centers and national institutions to complement technical competence and provide a means of continuity after project completion. In this process those centers which may be designated as subregional collaborating centers will receive assistance to further develop their capabilities.

Special attention will be given to the education and participation of the community in environmental health and integration of environmental health in the development of primary health care. The focus will be on provision of management capability, technical competence, and orientation to

the proposed components of the project: institutional development of environmental health agencies including water supplies, sanitation services and occupational health, food sanitation, solid waste, pollution control and vector control; water quality control, strengthening of regulatory and laboratory services; and manpower development in water supplies and environmental health.

Among the main strategies of the project are the establishment of a network of collaborating centers, development of information systems, and training activities through workshops to strengthen technical cooperation among the countries.

Centers—including those in St. Lucia, Costa Rica, Venezuela, Mexico, Guatemala, and the United States—will be encouraged to exchange information among themselves and develop agreements for technical cooperation with countries. Countries may also develop mutual agreement for cooperation in specific areas between themselves. In addition, at the country level, agencies will be identified to become national focal points for project formulation and implementation.

Caribbean Environmental Health Institute

The initiative to establish a Caribbean Environmental Health Institute stemmed from an expressed interest by the Government of Saint Lucia to make a physical facility available and a realization on the part of some countries as to the necessity of maximizing the limited resources among the English-speaking Caribbean countries, particularly the less-developed ones. Meeting this original objective of technical cooperation among developing countries will depend on a number of factors.

Among the factors is the principle that the functions of the Institute be catalytic, i.e. primarily directed to strengthening national institutions in the subregion so that ultimately self-reliance among developing Caribbean countries might become a reality. In-house activities should be kept to a minimum; instead staff would work with existing national entities to form a network of collaborating institutions on specific program activities. Moreover, the Institute would assist in project preparation and in seeking extrabudgetary resources, particularly for the smaller Eastern Caribbean countries.

At a meeting on this subject held in Grenada in 1978 a number of donor countries and specialized agencies of the United Nations agreed to support projects, once it was established by the interested governments. The governments' support for a core staff was considered essential, since it

would represent a commitment that might sustain the future growth of the entity.

One of the first agencies to support a project at the still-to-be-created Institute was UNEP. It agreed to finance projects on the protection of the marine and coastal environment and solid waste management (US\$300,000), including land-based pollution surveys in the Caribbean islands. As originally perceived, the implementation of this project might facilitate Institute development, while awaiting full funding of the core staff and the formal ratification by governments. In the interim, the project is being administered by CARICOM.

To date, three staff members—the project manager and two other scientists—have been hired to implement the UNEP program and are stationed in Saint Lucia. The Institute benefitted from laboratory and transport equipment left by the completed schistosomiasis control project. Some additional equipment has also been purchased. Present efforts are being directed to reviewing background data and developing a plan of action.

The latter will include identifying the categories of pollutants that need to be monitored, examining training requirements, and reviewing guidelines for implementing baseline studies prepared by international agencies. Some preliminary work has also been done in identifying and establishing links with national agencies that may collaborate in the studies. Consultants have been recruited to carry out solid and liquid waste surveys in several Caribbean islands.

A workshop is planned for the fall of 1982, to which personnel from national institutions doing work relevant to the UNEP marine and coastal environment projects will be invited. Its purpose will be to exchange information and to familiarize others with the scope of the work to be done so that at a future date it may be possible to enter into a collaborative arrangement for the implementation of this and other projects.

It is envisaged that when the Institute is established it may be possible to extend the collaborating network idea in areas of training, research, and information exchange. It might serve as a Caribbean channel through which information could be made available to all national entities in the subregion. The Caribbean Basin Management Project, whose main purpose is establishment of a training delivery system, might also be managed by the Institute. Furthermore, it could serve as a subregional center for such worldwide environmental programs as the Global Environmental Monitoring System (GEMS). Finally, the Caribbean Environmental Health Institute would be a ideal center to collaborate and host important events,

such as the Caribbean Subregional Workshop on Pesticide Management, held in the summer of 1982.

Turks and Caicos Study Conducted

PAHO commissioned a study on the development of water supplies and environmental sanitation services in the Turks and Caicos Islands. The study produced a Master Plan and presents current and future population data, present and future domestic water demands, a short-term government works program, draft water resources legislation, and recommendations on ground water protection zones. The financial aspects of the Plan were considered in relation to the local economy, recent capital expenditures, and the present cost of water supply to the consumers. Discussions were also held on a number of environmental matters considered to be important and which are related to water resource conservation and public health.

As part of the same study, analyses were conducted to quantify the fresh water resources of the islands. Five elements of the resources were studied: private catchment and storage facilities, public catchment and storage facilities, airfield catchments, groundwater, and desalination. The developable resources available from private and public facilities were estimated. On the islands the abstraction of groundwater at any one point is very small, as there is only a limited amount of rainfall reaching the water table. The recommended first priority was improvements to existing private and public catchment/storage facilities.

Caribbean Environmental Health Memo

PAHO staff in the Caribbean are publishing a quarterly memorandum on ongoing environmental health activities in the area.² The April 1982 issue reported on the Annual Caribbean Water Engineers Conference (October 1981, St. Vincent), which recommended: greater national investment and external assistance in the field of water supply and sanitation; special efforts in manpower development, program implementation, and technical cooperation among developing countries; and continued support of the Caribbean Basin Water Management Project.

²Further information on the memo can be obtained by contacting the Area Engineer Advisor, c/o PAHO/WHO, P.O. Box 508, Bridgetown, Barbados.

The "Memo" also reported on discussions held at the Second Meeting of the Inter-Agency Group on the Environment, which included the CARICOM/PAHO Caribbean Environmental Health Strategy, the Caribbean Environmental Health Institute in St. Lucia, the CARICOM/UNEP Coastal Environment Project, disaster prevention and preparedness, control of toxic pesticides, human resource development, the Caribbean Basin Water Management Project (including postponement of the transfer of project management from PAHO to the Caribbean Development Bank), food safety, occupational health, and resource mobilization.

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